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The New Year

The President writes :—

IT is my privilege to have this opportunity of wishing all members of the Association and their families a very happy New Year. 1959 will bring new problems for the profession and the individual, but I am confident that these will be met and overcome as successfully as in past years, and I hope that the coming one will see the fulfilment of all we could wish for the profession and for ourselves.

During 1959 the Association will take the important step, long advocated in many quarters, of appointing a member of the profession to be its principal permanent official. Readers will have seen the advertisement of the post which has been published in recent issues, and will have noted that one function—of cardinal importance—to be discharged will be that of public relations. There is almost no limit, in this field, to what may be accomplished, for public ignorance of the part played by veterinary surgeons in the life of the community is profound. Let us be just and admit that, to an extent, this is the profession's own fault: in its dislike of crying its own wares, and its distaste for anything savouring of self-advertisement it has tended towards the other extreme. Now is the time for the trend to be reversed. Not with vainglory, but with a proper pride of achievement we should let it be known that the success against bovine tuberculosis, the eradication or containment of major diseases, the protection of the public from infections of animal origin, the practical application of A.I. on the farm, animal preventive medicine, and a host of other things derive from the work—often too self-effacing—of the veterinary surgeon.

To make the community aware of the scope and value of our services is to advance our status, and in turn make possible a more effective and authoritative voice in the fields of agriculture and public health, and secure for our profession its proper representation on official bodies dealing with these subjects. This is one of the aims which the Professional Secretary will have in mind; but let it be remembered that, even when his advocacy is made available to the Association the fact remains that the basis of all public relations is the reputation of each individual veterinary surgeon among his clients and in his immediate environment. No amount of special pleading, however skilled, can take the place of individual work well and conscientiously done.

As the New Year is a time for taking stock of one's own usefulness among other things it may be suggested that the new post provides the opportunity not only of an interesting occupation of almost limitless scope, but the chance of rendering great service to the profession. For a man of imagination, who is not afraid of having dreams and trying to realise them, not the least attraction will be the idealistic one of serving his professional brethren and helping to strike out new paths for our Association to follow. It may even be that those who find grounds for criticism of the B.V.A. will offer themselves in order to set right such shortcomings as they profess to see, and to introduce novel and invigorating ideas.

For although no one would wish to stifle criticism or to ignore constructive suggestions, an impulse of gratitude may justifiably go out at the turn of the year, to all those who, by accepting office, or serving on Council and standing committees as the elected members of Divisions, give so much time and thought to the work of the Association, and without whom it could not continue to function. Indeed, another important duty of the Professional Secretary should be to relieve the officers—in particular the President—of part of that ever growing burden which, if not ameliorated, may make the acceptance of office well nigh impossible for those in practice. The new appointment, when it is made, will turn a page in the history of our Association, and it will be a general New Year wish that success and happiness attend the successful candidate, whoever he may be.

The Contribution of the Feeding-stuffs Trade to Health on the Farm*

BY

W. R. WOOLDRIDGE

Scientific Director, Animal Health Trust

I HAVE chosen this title for my talk to you to-day for three reasons. Firstly, the need to pay greater attention to the feeding or nutrition of farm livestock; secondly the greatly increased rôle of the Feeding-stuffs Trade in the provision of feeding-stuffs to the farmer; and thirdly the greatly increased part played by the veterinary profession in advising the farmer on all aspects of preventive medicine. Perhaps I might be permitted to add a fourth reason, namely the fact that the three reasons I have given to you are inter-related and therefore it is essential that the farmer, the feeding-stuffs merchant, and the veterinary surgeon should all understand each other and work together if the optimum results are to be obtained.

A major factor conducive to the improvement of farm livestock both in quality and value is the control of the major epidemic diseases, such as cattle plague or rinderpest, bovine pleuropneumonia, and foot-and-mouth disease. We in Great Britain are very fortunate in that these major diseases were brought under control in the nineteenth century, and now, apart from an occasional outbreak of foot-and-mouth disease, this country is free from all the major epizootic diseases. This has made it a far less hazardous task to breed better livestock over a period of years, and as a result modern farm livestock are far better than those of 50 years ago. Greater care and understanding of the individual animal has followed, and farmers have learnt to house, feed, and manage their animals under conditions conducive to high productivity.

The value of animals has also steadily increased and this is another factor which has influenced the amount of care a farmer will bestow upon his livestock, particulary in so far as their health and feeding are concerned. Considerable changes have taken place in methods of husbandry, and by and large all animals are now kept under far more intensified conditions than those existing a few years ago. Gone are the days of ranching, and cattle are often kept in cow-sheds or yards or allowed to graze at pasture under controlled conditions. Pigs are kept under intensified conditions in large piggeries, and are subjected to controlled rates of feeding, growth, and reproduction almost comparable to the mechanisation of production processes in factories. Similarly with poultry. Rarely are they now allowed to roam over the fields at random. Either they are kept in fairly restricted paddocks, or more frequently are housed in large numbers on deep-litter or in batteries. Even sheep are beginning to be subjected to a more intensive programme. They are often folded in the lowlands, but on the hills are now having food taken to them, particularly before and immediately after lambing.

Changing Agriculture

Thus, all the processes concerned with the management of animals are now being streamlined and wherever possible mechanised. The result is that when the animal is not producing milk, meat, or young it is feeding; rarely can it sit or lie about at leisure doing nothing. Often it is doing a double job, as for example in producing young and milk at the same time. This intensification of the producing powers of farm livestock is obviously placing a greater strain upon the farmer himself. He is expected to supervise everything that goes on on his farm, a matter of some difficulty considering how highly mechanised has become his crop production; and since a greater proportion of his farm-hands are becoming more interested in machines than in living animals, he is finding it ever more difficult to get men to supervise animals with a full knowledge of their requirements.

The farmer himself is expected to have such a wide knowledge of both crops and animals as well as soil that it is unusual to find one who is expert in every facet of these major subjects. Furthermore, he is expected to have knowledge of buildings, ventilation, machines, and other matters which were not considered to be so important a few years ago. For this reason his knowledge of balanced rations and feeding-stuffs must be limited and therefore to an ever-growing extent a farmer is being forced to rely upon experts to help him in different fields of his own very wide sphere of work. Gone are the days when a farmer who had an ailing animal could decide to kill that animal and get rid of it at once. Similarly gone are the days when a farmer could afford to keep an animal which was producing far less than it could do if properly housed, fed, and managed.

The Feeding-stuffs Trade

Let me now turn to the rôle of the feeding-stuffs trade in the livestock industries. Before we consider the scientific basis for this increased rôle, let us examine a few facts. The growth of the feeding-stuffs trade in the last few years in relation to farming has been immense. This is well borne out by the figures for 1957 when farmers spent about £320 million sterling on feeding-stuffs, £200 million of which was paid for compounded foods. We have only to contrast this with £86 million sterling spent on fertilisers

* Paper read to the Midland Counties Veterinary Association, November 14th, 1958.

to realise what an immense trade that concerned with feeding-stuffs has become. A few further figures might illustrate the rapidity of the growth of this trade. In 1930 the trade provided about 4 million tons of compounded foods, a figure which naturally fell during the war; then its rise began. In 1952, it had risen to 4.5 million tons; in 1953 it was more than 5 million tons; in 1956 it reached 6.6 million tons, and it is expected that in 1958 it will be about 7 million tons. Of course over these years there has been a great increase in the number of farm animals of all types, and consequently these figures might be thought to relate solely to the increase in livestock population. This is not so, however. In 1953 the percentage of the total concentrates fed on farms provided by the feeding-stuffs trade was 45, but in 1956 it had risen to 56 per cent. It is clear from these figures that the feeding-stuffs trade is playing a very important part in agricultural production and we may rest assured that it is unlikely to become less important.

This great growth in the feeding-stuffs trade is perhaps surprising, particularly in view of the fairly sustained propaganda drive to encourage farmers to grow their own foods and mix their own balanced rations on the farm. Why has this propaganda failed? Is it because comparatively few farmers can afford to buy the machinery which will enable them to mix thoroughly all the ingredients required in a modern balanced ration? Or is it because, even if they have the machinery they have not the expert labour required to prepare the mix nor have they the space to store satisfactorily the amount of foodstuffs they require, either as raw crops or as the subsequent balanced rations? When one did not bother about the addition of small quantities of various nutrients such as the mineral salts and the vitamins, it did not matter so much whether the rations were mixed by a shovel on a concrete floor; but nowadays one has many minor nutrients which must be added and thoroughly dispersed throughout the bulk of the balanced mixture. A further fact which tends to discourage farmers from mixing their own livestock rations, is that in order to balance a food mixture properly one should know the chemical analysis of the "straights" or home-grown cereals which are to form the basis of the ration. For instance, the protein content of home-grown products may vary greatly, a fact which makes it difficult to work them readily into a truly balanced ration. More often the farmer has no idea as to the true protein value of his crops and hence his mixing approaches guess work. This difficulty of formulating accurately the balance required for the use of particular crops in balanced rations will be exaggerated by inexpert and often too costly mixing processes. If the farmer is to mix his own balanced rations it is far better for him, generally speaking, to purchase the minor minerals in a pre-mix so that instead of having to add small percentages of the various vitamins and of the different salts he adds them all in a pre-mix supplied by the feeding-stuffs merchants. A pre-mix is a compounded mixture containing all the minor nutrients efficiently dispersed in a suitable cereal in a fairly high concentration. This pre-mix can then be added in a known percentage, such as 10 per cent., to his other products on the farm.

The formulation and preparation, however, of these pre-mixes is a task which can only be done skilfully by the knowledgeable feeding-stuffs merchant; ill health arises from bad or uneven mixing. It is interesting to note that the great advance in the development of the feeding-stuffs trade is soundly based on scientific knowledge. We have only to think back to the beginning of this century to realise what immense progress has been made in our knowledge of nutrition. In the early 1900's the farmer considered only the balancing of the major constituents of the diet such as carbohydrate, fat, and proteins, at the same time calculating the energy value of the mixture. This he regarded as a satisfactory and well-balanced food. After the period of doubt following the announcement in 1912 of Hopkins's initial experiments illustrating the importance of unknown constituents in small quantity in the diet, the early twenties saw a great advance in our knowledge of these minor nutrients. With the acceptance of one vitamin, chemists, biochemists, and others began to concentrate far more attention upon these accessory food factors. This led to an intensive amount of work, which resulted in the discovery of a large number of vitamins, many of which have now already been synthesised. This has enabled the scientist to work out by experiment the true function of several of the vitamins.

Similarly, a far greater understanding has been obtained of the rôle of many of the minerals which are required to-day. This work has been very painstaking and has resulted in a great extension of knowledge, the application of which on the farm has been largely made by the feeding-stuffs trade. Yet it is not easy even to-day to be certain that we have anything like the full facts that are required to feed an animal perfectly for its stage of growth and its phase of productivity. Just as, between 1912 and 1922, scientists were more often sceptical of the claims of Hopkins, so to-day there are many practical men in farming and other occupations who doubt the real importance of balancing foods correctly, bearing in mind the conditions associated with the livestock to be fed. The great variation in the dietary requirements of different livestock and the varying phases of growth of those livestock have encouraged the entry of experts into these fields. Many of the agricultural merchants a generation ago were not very expert in nutritional knowledge, but to-day few of them are without reasonable acquaintance with this branch of science. Even when they have not the knowledge themselves they usually employ experts who have been soundly trained to advise them and to keep them abreast of modern developments. The old idea has long passed that in the purchase of feeding-stuffs from a merchant, much of the mixture was composed of sweepings and other waste fibrous products, obtained from other manufacturing processes.

The compounder to-day has to have a sound knowledge of the proportions not only of carbohydrate, fat, and protein, but also of the amino-acid

content of those proteins and the variations in protein composition from one type of crop to another. Inevitably he endeavours to relate his mixture to the productivity of the animal whether it is producing meat by growing rapidly, is producing milk, or designed to lay eggs. He knows that he must approach his problem differently in all these cases. Latterly he has developed another specialism which is the production of foods to permit the early weaning of many young stock.

In all these different types of foodstuffs he has to mix in the right quantities of the various vitamins and the various minerals. Even this is not enough to-day, for he has to add various other types of ingredients such as those which are used to control or prevent the onset of a disease, or others which are claimed to be of value in increasing the rate of growth. Perhaps the very rapidity with which this nutritional knowledge has expanded over the last few years would have prevented it from being applied rapidly if it had not been for the fact that in the feeding-stuffs trade there are several firms who indulge in competition. As a result of this competition there has certainly been a great increase in the rapidity with which this knowledge has been applied. Many of the firms have established their own experimental farms and carried out much nutritional research. Some of them have worked upon rations, modifying them and working out the very best admixture of the various constituents. Others have actually not only isolated vitamins but have synthesised them. The feeding-stuffs trade thus assists with both fundamental and applied research in animal feeding.

Research and Advisory Services

Experimental farms also played another rôle in the feeding-stuffs trade, for often the merchants themselves, particularly those who had a basic knowledge of nutrition, had to convince themselves of the value of different balances in the rations they produced. They further had to justify the inclusion of various additives for the control of disease or the increased growth of livestock.

Another contribution which the trade is making towards the health of livestock is through the appointment of a large number of advisers, many of whom belong to the veterinary profession. These individuals visit the farms and are able to discuss with the farmer the feeding of his stock. Inevitably they are playing a great part in preventive medicine, although their advice is primarily aimed at assisting the farmer to get his animals in optimum condition and productivity. It is important, however, that this advice is correlated with that of the farmer's own veterinary surgeon. Such an adviser, too, by getting into contact with the farmer and taking an interest in his management problems is able to advise him on various individual and local aspects of his feeding programme. For instance, he is able to give advice upon the feed necessary to wean his calves and other animals earlier than is normal; he can make suggestions as to the way the farmer should incorporate in his feedstuffs a magnesium compound to counteract the loss of magnesium which might arise when cattle or other stock are kept in houses rather than at pasture. Furthermore, he can advise a copper-rich diet to those farmers living in teart areas. Not infrequently these representatives of feeding-stuffs firms give advice on adding antibiotics or special medicinal products such as coccidiostats or anti-blackhead compounds for the poultry farmer. It is even more important that there be full co-operation between the veterinary surgeon and the adviser of a feeding-stuffs firm in matters such as this.

Finally, we must not forget the value to the farmer of the researches carried out by many feeding-stuffs firms into the mixtures that best maintain the qualities of the ingredients in them for a long period. Changes arising from ageing are examined, and if these prove to be deleterious, methods are worked out to slow up or arrest these ageing processes.

The Veterinary Position

The third reason I advanced for reading this paper was the fact that the veterinary profession has, of recent years, assumed far greater importance in the welfare of the nation's farm livestock and their products. It must not be forgotten, however, that the growth in importance and status of the veterinary profession has developed in parallel with the great increase in both the numbers and quality of all species of farm livestock including poultry. Whilst the practising veterinary surgeon learns at the university all the basic sciences underlying his professional training and a mass of information concerning the management of all species of domesticated animals and poultry as well as the cure and prevention of their diseases, it is becoming increasingly difficult for a single person to keep this knowledge fully up to date and apply it efficiently in practice. As a consequence there is arising a tendency for veterinary surgeons to specialise, and those practices which include a large number of veterinarians are beginning to allow specialisation within the practice. This specialisation tends to relate to species rather than to type of work and consequently, so far as I know, there is no practice in which a veterinary surgeon has specialised in animal nutrition. Most veterinary practices to-day devote a large part of their time and effort to preventive medicine, a branch of their knowledge which is closely associated with optimum nutrition. Unfortunately, from the point of view of the busy practitioner the science of nutrition is advancing so rapidly that it is becoming more difficult for him to keep his knowledge fully up to date in these matters. Here, then, is another reason why the veterinary surgeon and the feeding-induce at its optimum levels both high productivity and a reduced susceptibility to infection.

Discussion

The science of nutrition, when applied to the keeping of livestock, has a three-fold aim. First, the rations supplied to the animal must be adequate to maintain that animal in a condition of reasonably good health. Second, it must offer to the animal through the rations that extra food which will provide

both the individual nutrients and the energy necessary to enable it to give of its maximum productivity or performance. Thirdly, applied nutrition is failing in its task if it does not do something more than merely secure the absence of obvious disease; it must induce at its optimum levels both high productivity and a reduced susceptibility to infection.

From the practical point of view it has been indicated how every effort has been made by the feeding-stuffs trade to meet these requirements. In a sense it sells nutrition in a bag, and as a result of this there has been a tremendous increase in the total quantity of prepared foods bought by the farmer. The preparation of these foods is based on careful experimental work, not only so far as planning the nutrients is concerned but also in the preparation of foodstuffs of suitable texture, attractive taste, and good keeping quality. Undoubtedly there has been an increase in both the rates of growth and production of most of our farm livestock of recent years, and the intensification of livestock-keeping has increased the risk of vitamin and mineral deficiencies. The trade has foreseen these possibilities and has done much to counteract the danger by supplying the minor nutrients in a form leading to easy absorption by the animal and satisfactory keeping qualities while waiting in the bag. It has already been shown that the preparation of feeding-stuffs in proper nutritional balance and with adequate supplies of the micro-nutrients nowadays prevents a considerable amount of illness. Latterly, however, individual substances have not infrequently been added to feeding-stuffs with the object of preventing a particular disease. Thus coccidiostats and anti-blackhead substances are supplied to chick and poult diets, whilst zinc is added to the diet of pigs to safeguard against the non-specific form of dermatitis. Incidentally, research work associated with this latter compound was in part worked out by the research laboratories of a particular feeding-stuffs firm.

Attempts are being made to counteract hypomagnesaemia by the addition of magnesium salts to the diet of cattle at certain times.

When we come to the addition of antibiotics, with the intention not of counteracting specific diseases but of encouraging in some way, as yet not fully understood, the more rapid growth of young stock, we are entering another field. It has been shown that the addition of these substances may result in certain disadvantages, but on the other hand it would appear that under practical conditions they can lead to more rapid growth. This is a problem for the farmer to decide, and if his decision is in favour of feeding-stuffs containing antibiotics, then the merchants might be expected to supply this feed.

Unfortunately, from the point of view of the veterinary profession, it would appear that there is a growing tendency now to add other pharmaceutical products to feeding-stuffs in addition to those liable to improve the rate of growth. Certain hormones, for instance, are already being added and suggestions have been made that tranquillisers should also be incorporated in the diets. The view of the veterinary profession is that these pharmaceutical products should not be added except with the consent of the veterinarian, and then only in circumstances meriting their addition. It should be pointed out, however, that the feeding-stuffs firms themselves do not manufacture these pharmaceutical products and it is doubtful whether they increase their own profitability by incorporating them in their feeding-stuffs.

It may be claimed that the introduction of early weaning techniques to calf rearing has led to a reduction in the spread of calf scours which was common in the hand-rearing techniques. They also, of course, bring the calf on to a roughage regimen sooner thereby causing it to utilise this form of food better at an earlier date. It must, however, be emphasised that in their general aim to improve health and productivity of animals on the farm the feeding-stuffs trade must be keenly appreciative of the dangers associated with the addition of antibiotics, hormones, and such products. The full implications of the development of resistant strains in all potential pathogenic bacterial populations has not yet been fully realised, but it should not be minimised solely in the interests of profits. The continuous feeding of dietary "additives" should not be adopted without full investigation of their effects over a sufficiently lengthy period of time.

Every care should be taken to ensure that the raw materials used by the feeding-stuffs merchants are free from disease. The use of bone meals imported from countries where such diseases as anthrax and certain salmonelloses not present in this country are prevalent can lead to outbreaks of disease. Unless properly sterilised the use of such products runs counter to the general aims of the animal nutritionists to improve the animals' optimum level of nutrition and health.

In conclusion, then, we may hazard the opinion that whilst the rôle of the feeding-stuffs trade in the livestock industry has already grown to immense proportions, it will develop still further provided it continues to be based on sound knowledge of all aspects of animal nutrition, readily adapts itself to changes in this knowledge, which is carefully applied with every effort being made to see that the products are not allowed to deteriorate on the shelf. In applying this knowledge he must make certain that he has received full veterinary advice and that any difficulties which may arise on the farm are sympathetically dealt with both in co-operation with the farmer and with the farmer's veterinary surgeon.

THE WELLCOME FOUNDATION PRIZE

The Prize (consisting of £20 in books) presented by the Wellcome Foundation, for the best student in Animal Pathology in 1958, has been awarded to Mr. B. R. Loveday, B.A., of Downing College, University of Cambridge, who passed the First Part of the Veterinary Examination with special merit.

Mucormycosis and Moniliasis in a Litter of Sucking Pigs

BY

M. GITTER and P. K. C. AUSTWICK
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Weybridge

SUMMARY.—An outbreak of gastric mucormycosis in a litter of 2- *to* 13-*day-old piglets and an unrelated case in a* 2- *to* 3-*week-old pig are described.*

Rhizopus microsporus *was isolated from the stomach lesions and bedding.*

Concurrent infection of Candida albicans *was present and the yeast recovered from oral and oesophageal lesions, bedding, drinking water, and air of piglets' pen.*

No lesions of moniliasis were found in the unrelated case although C. tropicalis *was isolated in quantity from the stomach.*

Introduction

RELATIVELY few cases of mucormycosis in pigs have been reported and judging from this the incidence of the disease would appear to be very low. No earlier record has been found than that of Christiansen (1922) who described two cases of generalised mucormycosis, in one of which 4 ulcers were found in the mucosa of the small intestine and *Absidia ramosa* was isolated from the liver lesions. The other case was attributed to *Rhizopus equinus* (= *R. microsporus*).

Two cases of gastric mucormycosis in 8- and 6-month-old pigs, which had died of swine fever, were described by Tscherniak (1934), and 3 by Walkiewicz (1934) in 8- to 9-month-old animals, also suspected of swine fever. Tscherniak *et al.* (1937) in a paper dealing with 17 cases of mycoses in domestic animals recorded 5 more cases of gastric mucormycosis in pigs. The lesions described by these workers were in the form of large ulcers situated on the mucous membrane of the cardiac and pyloric zones of the stomach.

Tumour-like lesions have been found in the mesenteric lymph nodes (Christiansen, 1927), liver (Hoogland, 1932), lungs and abdomen (Pallaske, 1939), inguinal and submaxillary lymph nodes (Vink, 1941), the lungs and cervical and bronchial lymph nodes (Davis *et al.*, 1955). A generalised case of mucormycosis has been reported by Kretzschmar (1954). Almost all these cases were in adult pigs and were mostly found during meat inspection.

There is no published account of mucormycosis in pigs in Great Britain and this paper deals with an outbreak in a litter of sucking pigs where concurrent infection with *Candida albicans* was also present. An account of a single unrelated case is also included. The few reported cases of moniliasis in pigs have been reviewed by Done, Richardson, and Austwick who recently recorded an outbreak in weaned pigs.

Case History

The outbreak occurred in a large piggery with a breeding stock of 5 Landrace boars and over 50 sows. During pregnancy the sows were kept in the field where some farrowed in arks, others being brought in about a week before farrowing and housed either in wooden farrowing pens or in wooden huts with concrete runs. Straw or wood shavings were used as bedding. The sows were fed proprietary meal till about 10 days before farrowing and from thence home-mixed sow and weaner meal with chlortetracycline,* later replaced by oxytetracycline.† The piglets were given intramuscular iron compound injection on the third day of life and creep feeding started at 4 to 5 days.

There had been an increasing mortality in piglets, from 3 days to 3 weeks of age, during the previous few months and the only clinical symptoms were dullness, anorexia, and death within 12 hours. The *post-mortem* findings were negligible; some piglets had completely empty stomachs, while in others the stomachs were filled with milk curds. Purulent polyarthritis due to a Streptococcus, commonly associated with meningitis and/or arthritis in young piglets, was diagnosed in one litter and possible septicaemia due to a Group L Streptococcus in another; otherwise bacteriological examination and *post-mortem* findings gave no clue as to the cause of death.

The litter discussed here was born on January 1st, 1958, in a wooden farrowing pen about 10 × 12 ft., with straw bedding and a wooden partition for creep feeding. Previously this pen had been used for weaners and 6 months before that for calves, but before the sow was brought in the pen had been thoroughly scrubbed and disinfected. Of the 10 healthy-looking piglets 2 were crushed within 12 hours of birth but the sow had plenty of milk and the litter was apparently doing quite well. On the 3rd day the piglets started to scour but still continued to suck. Two died on the same day, and on the following day a further 2 were found dead. Of the remaining 4, 2 piglets apparently continued to grow well. The others scoured badly for another 2 days and thereafter intermittently, their growth becoming obviously stunted. One of them was destroyed on the 13th day by an intracardiac injection of pentobarbitonum sodium B.P., the other which was slightly bigger eventually recovered.

Post-mortem examination on the piglets which died on the 3rd and 4th day was carried out on January 7th, the 5th piglet was examined on the day it was destroyed, *i.e.* January 13th.

Post-mortem findings were as follows:—

No. 1. Male, 3 days old, weight 3½ lb. Stomach

* Aureomycin.
† Terramycin.

full of milk curds; the wall of diverticulum ventriculi thickened and oedematous; the gastric mucosa congested and a large haemorrhagic area about 20 mm. diameter in the diverticulum; small intestine empty; rectal contents very thin in consistency, mesenteric and gastro-hepatic lymph nodes normal in appearance.

No. 2. Female, 3 days old, weight 2 lb. Stomach, intestine, and rectum empty. A small quantity of caseous material in the diverticulum ventriculi, slight thickening of its wall, and slight congestion of its mucosa.

No. 3. Female, 4 days old, weight 2¼ lb. A crushing injury in form of a ruptured left central lobe of the liver and blood clots in the abdominal cavity. Marked thickening of the wall of diverticulum ventriculi. A raised, circular, haemorrhagic lesion about 25 mm. diameter and 5 mm. thick present on the mucosa lining the diverticulum, almost completely filling its lumen. Close to this lesion were three 2- to 4-mm. round, dome-shaped areas with haemorrhagic margins and pale centres. Only a small quantity of milk curds present in the stomach; the small and large intestine and rectum empty.

No. 4. Female, 4 days old, weight 2¾ lb. A small quantity of milk curds in the stomach; small intestine empty; rectal contents very thin in consistency. Lesions in diverticulum similar to No. 1; in addition, small haemorrhages about 1 mm. diameter on the cardiac mucosa.

No. 5. Female, 13 days old, weight 3½ lb. A small dehydrated carcase. 1- to 2-mm. diameter white specks found adherent to the upper labio-gingival junction, to the dorsum of the tongue between the papillae of the root, and to the oesophageal epithelium. Stomach full and its diverticulum filled with caseous material; the wall of the diverticulum markedly thickened and its mucosa congested; the rectal contents yellow and semi-fluid.

No. 6. A single case of gastric mucormycosis was found in a 2- to 3-week-old pig from another farm where over 20 sows were kept. There was a history of vomiting and severe scouring in both the sows and piglets and a number of the latter died. Only one piglet was obtained for a *post-mortem* examination and the findings suggested that the stomach was, in all probability, the site of primary dysfunction. The mucous membrane of the fundus was markedly congested and an ulcer about 55 × 60 mm. with a raised haemorrhagic margin and a greyish-yellow, depressed, necrotic centre was present on cardiac mucosa. The diverticulum ventriculi was filled with a mass of caseous material and only a very small quantity of milk curds was present in the stomach. The small intestine was empty, the colon mucosa slightly congested, and the rectum empty. No other abnormality was found and the gastro-hepatic and mesenteric lymph nodes appeared normal.

Bacteriological and Mycological Examination

Methods

Direct microscopical examination. Small pieces of tissue were removed from the margins and the central necrotic zones of the ulcers, mounted in water or saline and teased apart with needles before crushing gently with a coverslip. Oral and oesophageal lesions in No. 5 were examined by scraping the lesions and mounting the material in a drop of water on a slide. Thick smears were prepared from the lesions and were stained by the periodic acid-Schiff technique.

Cultural examination. For bacteriological examination 5 per cent. sheep blood and MacConkey agar plates were used and after inoculation were incubated at 37° C., aerobically, anaerobically, and in 10 per cent. carbon dioxide atmosphere. For the mycological examination most of the methods described in our previous paper (Gitter & Austwick, 1957) were repeated for the material from all 6 pigs. In Nos. 4 and 6 hyphae were dissected out from the necrotic tissue near the margins of the ulcers, washed several times in sterile saline, and placed individually on the surface of 2 per cent. malt agar plates (containing 20 units of penicillin and 40 units of streptomycin per ml. of medium). Serum broth tubes containing a similar antibiotic supplement were also inoculated with a few dissected hyphae. In Nos. 1 and 3 small pieces of necrotic tissue again from the margins of the ulcers were washed several times in sterile saline, added to molten malt agar (with antibiotics), and poured into plates. In addition to these special techniques for the ulcerated areas, samples of the stomach contents of all piglets were streaked on to malt agar and this method was also used for culturing from the oral and oesophageal lesions in No. 5. Samples from the vagina, udder, and rectum of the sow were also treated in this way and the creep feed, drinking water, and bedding from the partitioned area of the pen were examined by both streaking and dilution techniques. One plate of malt agar was exposed to the air on the floor of the pen for half a minute.

Results

Direct microscopical examination. Fresh preparations from the stomach lesions showed the presence of extensively branching hyphae. These were 3.5 to 8 μ in diameter, vacuolated or with dense, oily contents mostly aseptate and typically mucoraceous. The branches arose chiefly at right angles and either tapered gradually or terminated in a series of dichotomies typical of trophic hyphae. Occasional thick-walled, intercalary chlamydospores were seen.

Stomach contents of all pigs and the oral and oesophageal lesions of pig No. 5 showed large numbers of yeast cells 1.5-4.5 × 1.5-3.5 μ together with pseudomycelium 1.5-2.0 μ wide.

On bacteriological examination, in all 6 cases, no growth was obtained from the livers, lungs, spleens, kidneys, and gall-bladders, and a mixture of non-haemolytic *Bact. coli* and α-haemolytic streptococci was recovered from the intestinal tract.

Isolations from the gastric ulcers. Isolates of a rapidly growing mucoraceous fungus were obtained both by direct plating of pieces of ulcer and from dissected-out hyphae in Nos. 1, 3, and 4. The colonies reached diameters of 8 to 23 mm. in 16 hours on malt agar at 37° C., growing at a rate of nearly 2 mm. per hour. At first they were flat and

moist but by 24 hours had produced aerial branches on which sporangia began to form. In each case the fungus was identified as *Rhizopus microsporus* van Tieghem but none of the isolates was quite typical and the strain may be a distinct variety. Attempts to isolate the fungus directly from the lesions of pigs 2 and 5 were unsuccessful. In No. 6 particular attention was paid to the distribution of the fungus in the lesion and its isolation was attempted from several different areas of the ulcer. The results are given in the following table:—

Site Sampled	Microscopical examination for hyphae	Isolations of *Rhizopus microsporus* No. isolations	No. inocula
Mass inoculum from central necrotic zone	+	0	4
Dissections of hyphae from:—			
(a) Base of necrotic mucosa 33 mm. from margin	+	4	4
(b) Ditto. 8 mm. from margin	+	5	6
(c) Oedematous area of submucosa directly beneath margin	+	0	6
(d) Sub-mucosa 3 mm. beyond margin ...	−	0	6

Description of Rhizopus microsporus

Sporangiophores 200 to 600 μ high, with thick brown walls, arising in groups of 2 to 4 wherever the stolens meet the substrate. Sporangia 30 to 70 μ diameter grey to black, columellae oval 20 to 60 μ across, light brown. Spores 4 to 6 μ diameter globose or subglobose, greyish, surface minutely roughened, and occasionally lightly striated. Chlamydospores frequent, oval, or irregular 10 to 15 μ × 8 to 12 μ, intercalary, colourless, thick-walled with dense granular contents.

The main discrepancy between our isolates and *R. microsporus* van Tieghem is that the spores of the latter are 3 to 4 μ diameter. There is still much confusion in the description of the pathogenic Mucoraceae and until the group is revised it is not possible to precisely determine our isolates.

Isolations from the stomach contents. Samples of the stomach contents, mostly the mucus in the cardiac zones, were examined from all 6 piglets. Cases 1 to 5 produced copious growth of *Candida albicans* and in Nos. 1, 2, and 5 single colonies of *Rhizopus microsporus* were obtained. The only other fungi isolated were *Absidia ramosa* (once) and a *Mucor* sp. (twice). In No. 6 *Candida tropicalis* grew in pure culture from the mucus of the oesophageal zone and was accompanied in the stomach contents by a few colonies of a *Sporotrichum* sp.

The lesions on the dorsum of the tongue, lip, and oesophagus of No. 5 yielded pure cultures of *Candida albicans* which was also obtained from the small intestine.

Isolations from the environment of the piglets. From the creep feed a few colonies of *Absidia ramosa*, *Mucor pusillus*, *Aspergillus flavus*, and *A. nidulans* were recovered while *Mucor pusillus*, *Aspergillus fumigatus*, and *Rhizopus microsporus* together with several colonies of *Candida albicans* were isolated from the bedding. This yeast also appeared in pure culture in the isolations from the drinking troughs, and was the only organism to appear (as a single colony) on the plate exposed to air. No growth of fungi was obtained from the vaginal and rectal swabs of the sow but four colonies of a *Trichosporon* sp. were recovered from the milk.

Isolations from further piglets. Mycological examination was carried out on 8 piglets from 4 further litters on the farm. There were no lesions in the stomachs of any of these and neither *Rhizopus microsporus* nor *Candida albicans* were isolated from the stomach contents although a variety of filamentous fungi were recovered (*Absidia ramosa*, *A. corymbifera*, *Mucor pusillus*, *Aspergillus fumigatus*, *A. nidulans*, and *Penicillium piceum*). One piglet gave a pure growth of a *Pityrosporum* sp. and another *Torulopsis glabrata* and a *Trichosporon* sp. No evidence of *Rhizopus microsporus* was found in the samples of bedding straw and wood shavings from these pens.

Histological Examination of the Lesions

Stomachs

The mucous membrane of the affected parts was always almost completely destroyed and in its place there was an amorphous, pale eosinophilic mass without nuclei, often many times thicker than normal mucosa. Towards the periphery of the necrotic parts the outlines of gastric glands were seen. Surrounding the necrotic mass and following the invading hyphae were dense zones of inflammatory cells consisting of polymorphs, lymphocytes, macrophages, epithelioid cells, and in cases 5 and 6 also giant cells of the Langhans' type. The extent of cellular reaction varied with the depth of hyphal invasion and the character of the cells was more or less closely associated with the age and development of the lesions. The muscularis mucosae and submucosa were oedematous and the tunica muscularis beneath the lesion thickened. The blood vessels in these layers were dilated, congested, and often thrombosed. When present in the serosa the cellular reaction was seen only around the blood vessels or invading hyphae. From the surface of the affected parts large numbers of hyphae were seen penetrating vertically the underlying tissues and often invading the thrombosed blood vessels. The hyphae were 2 to 8 μ thick, coarse, mostly non-septate with strong branching at acute or right angles. They were readily demonstrable in haematoxylin and eosin-stained sections which, contrary to our experience with mucormycosis in calves (Gitter & Austwick, 1957), were quite satisfactory for the purpose of diagnosis or for photomicrography. The periodic acid-Schiff technique also gave good differentiation of hyphae. The hyphal penetration was generally deeper than that recorded by us in calves reaching in every case the tunica muscularis and the serosa in two.

Individual Variations

No. 1. Extensive cellular reaction swamping the muscular mucosae, infiltrating the oedematous submucosa, and reaching the thickened tunica muscularis. Numerous hyphae present in the necrotic mucosa and invading the muscularis mucosae and submucosa, surrounded by polymorphs, macrophages, and relatively fewer lymphocytes. Subserous blood vessels dilated. A few hyphae and yeast cells present in the amorphous caseous material in the diverticulum ventriculi.

No. 2. The bodies of cardiac glands well discernible. The necrotic mucosa raised in a fold over grossly oedematous submucosa and thickened tunica muscularis. Numerous polymorphs and some eosinophils surrounding the hyphae in the submucosa. The hyphae reaching the serosa. Small numbers of yeast cells and only a few hyphae in the caseous plug in the diverticulum.

No. 3. A.—The large lesion in the diverticulum. Structural details of mucous membrane completely lost. The capillaries of lamina propria markedly dilated and congested. Cellular reaction reaching the outer layer of the thickened tunica muscularis. Developing granulomata consisting mostly of the mononuclear cells with macrophages clustering around hyphae. Hyphal penetration reaching the outer muscle layer. Blood vessels in submucosa as in No. 1 but congestion, thrombosis, and hyphal invasion more severe. On the periphery of the lesion in the submucosa numerous polymorphs present but on the whole these were fewer than in Nos. 1 and 2. No yeast cells in the diverticulum contents but many in the apparently unaffected mucosa in other parts of the stomach.

B.—The small, circular lesions. Early lesions. Necrosis of surface epithelium, the capillaries of lamina propria dilated and congested. Hyphal invasion and cellular reaction reaching submucosa. Polymorphs very numerous. Submucosa and inner muscle layer oedematous. Blood vessels of submucosa as in No. 1. Yeast cells and pseudo-hyphae present on the periphery of lesions.

No. 4. Some outlines of cardiac gland bodies just discernible, otherwise the mucous membrane completely destroyed. Hyphal penetration and cellular reaction reaching tunica muscularis with numerous macrophages clustering around the hyphae and blood vessels.

No. 5. Distinct formation of infective granulomata in the submucosa and tunica muscularis with hyphae surrounded by cellular debris, polymorphs, mononuclear cells, and some fibroblasts on the periphery. Epithelioid and giant cells of Langhans' type, engulfing portions of hyphae. Tunica muscularis disorganised by hyphae and inflammatory cells.

No. 6. A. The ulcer. The necrosis and obliteration of structural details progressively more marked from the margin towards the centre of the ulcer. At the margin the capillaries of lamina propria and the blood vessels of submucosa engorged with blood, some ruptured, and the whole area markedly hyperaemic. The hyphal invasion and cellular reaction consisting mainly of polymorphs and eosinophils extending to oedematous submucosa. Tunica muscularis swollen. At the centre of the lesion structural details of the stomach wall are completely lost. Massive necrosis and very numerous inflammatory cells, mainly mononuclear in character, following the hyphae and reaching the serosa. Many nuclei of the cells following the hyphae undergoing pycnosis and karyorhexis. Most of the blood vessels in the central area thrombosed and haemorrhages also present.

B. The congested area in fundus. Degenerative changes in the surface epithelium. Muscularis mucosae swollen and almost obliterating the submucosa. The capillaries of lamina propria and blood vessels dilated and congested. No evidence of hyphal invasion.

C. The contents of diverticulum. An amorphous mass with a few mononuclear cells and much cellular debris.

D. Mucosal fold on the periphery of the ulcer margin. Complete loss of structural details except for some outlines and fragments of cardiac glands. Granulomatous lesions with central hyphae surrounded by cellular debris, polymorphs, macrophages, and lymphocytes. Epithelioid and Langhans' type giant cells present.

Lesions Associated with Moniliasis

No. 5. A. The Tongue. Degenerative changes in the epithelium and accumulation of cellular debris, desquamated cells, yeast cells, and pseudohyphae in the concavities beneath the papillae where superficial penetration of the stratified squamous epithelium is evident. The vessels of the subepithelial connective tissue dilated and congested with focal infiltration of polymorphs, macrophages, and some lymphocytes.

B. The Lip. Very few pseudohyphae superficially invading the epithelium of the labiogingival groove with remains of a minute, focal reaction within the stratified squamous layers.

C. Oesophageal zone of the Stomach. Copious mucus, cellular debris, and desquamated cells on the surface and from this shapeless mass, yeast cells, and pseudomycelia invading the superficial layers of the stratified squamous epithelium showing degenerative changes. The capillaries of lamina propria and blood vessels of the submucosa dilated and congested. Fairly numerous mononuclear cells and a few eosinophils in the lamina propria. The muscularis mucosae markedly thickened and the submucosa slightly oedematous.

Discussion

There is good reason to believe that the incidence of mucormycosis in pigs is much higher than would be deduced from the relatively few recorded cases. Gastric ulcers similar to those described by Tscherniak and Walkiewicz are not infrequently seen in cases of swine fever and uninvestigated gastric ulceration has been noted on several occasions concurrently with other conditions. In the course of the routine diagnoses of animal mycoses over the past 3 years, 3

cases of mucormycotic ulceration in store pigs have been encountered (Austwick, unpublished), but hitherto no young pigs have been affected so that the cases reported here seem to constitute the first outbreak of the disease recorded in sucking piglets. Subsequently an almost identical outbreak has been found and will be recorded separately (Done, Richardson & Austwick), and it is highly probable that careful search may reveal that mucormycosis is more frequent in pigs than is at present realised.

The full appreciation of the true pathogenic significance of mucormycotic infection is difficult. Relatively few accounts of mucormycosis exist and in many of these the condition was only recognised on histological examination. Association with a concurrent disease has been shown by Tscherniak and Walkiewicz and it seems likely that circumstances leading to a disturbance in metabolism may render the animal more prone to fungal infection. It is interesting to note in this respect that although we examined, from the affected farm, 121 carcases of young piglets belonging to 27 litters, evidence of mucormycosis was found in the only litter which scoured.

The character and disposition of the lesions in the individual piglets is of considerable interest as it throws further light on the pathogenesis of the condition. It seems that in the youngest piglets (Nos. 1 and 2) the lesions were in the early stages of development. In neither of these animals, nor in Nos. 3 and 4 which had died on the fourth day, were there any signs of the development of chronic lesions and not until No. 5 (13 days old) and No. 6 (2 to 3 weeks old) were examined, was the formation of infective granulomata and of giant cells noted. This may explain why most of the reported cases of mucormycosis in pigs refer to tumour-like lesions, granulomata and giant cells encountered in animals considerably older than those in our outbreak. It may be postulated that had the piglets survived they might have developed tumour-like lesions at the site of the ulcers, as we have recently observed in a calf, and with possible metastases to other organs as described in cases of generalised mucormycosis.

Kretzschmar (1954) postulates that the port of entry for mucormycotic infection in pigs is the intestinal tract, a possibility already referred to by Bendixen and Plum (1929) in connexion with mycotic abortion in cattle due to *Absidia ramosa*. Later on the original focus of infection in the stomach or intestines may become encapsulated, fibrosed, shrunken, covered by mucus, and eventually invisible to the naked eye, but owing to hyphal invasion of the vessels of the submucosa, the infection is taken up by the portal circulation and secondary foci develop in other organs and produce sizeable tumour-like lesions.

Apart from the haemotogenous spread lymphatic dissemination can probably also take place. There is evidence that in some cases a complete primary intestinal complex is present (Kretzschmar, 1954). In others the primary complex is incomplete with lesions either being found in the mesenteric lymph nodes (Christiansen, 1929; Pallaske, 1939), or, because of the short duration of the disease (the outbreak described here), in the stomach and/or intestine only.

In human mucormycosis Baker (1957) has put forward evidence for the occurrence of primary infection in the nasal and bronchial mucosae, in the cerebral and pulmonary forms of the disease respectively, and Watson (1957) has considered that gastric stasis in a child led to the invasion of the mucosae by mucoraceous hyphae with the formation of a perforating ulcer. In our cases the only evidence of gastric stasis was the filling of diverticula with caseous material in almost every piglet, and it is possible that this enabled *Rhizopus microsporus* to invade the mucosa from the caseated mass in the lumen of the diverticulum.

The concurrent infection by *Candida albicans* also provides information which may be of considerable importance in the epidemiology of moniliasis. Despite the presence of *Candida albicans* in quantity in the stomach contents and mucus of piglets 1 to 4, none showed gross lesions. Piglet No. 5, however, which was 13 days old, showed characteristic signs of moniliasis with lesions in the lower two-thirds of the oesophagus, on the dorsum of the tongue and in the labio-gingival junction of the upper jaw from which *Candida albicans* was recovered. The penetration of pseudo-hyphae into the stratified squamous epithelium in these areas was well marked and although a certain amount of reaction was present the lesions were not as well developed as has been seen in other cases of moniliasis in pigs. It may, therefore, be suggested that although *Candida albicans* was present in quantity in the stomach of the 3- to 4-day-old piglets the development of lesions required a longer period. In fact, the youngest piglets so far seen with clinical signs of moniliasis has been 7 days old. It was not possible to estimate how long lesions had been present in No. 5 and nor were we able to state which stage of development they had reached.

Another interesting observation has been the absence of lesions of moniliasis in No. 6 despite the copious presence of *Candida tropicalis* in the stomach. This species is of limited pathogenicity and its significance when found in lesions is still in doubt.

The most important aspect of the occurrence of *Candida albicans* in these outbreaks is its isolation from the environment of the piglets. Hitherto only 3 records from saprophytic sources have been reported—one by di Menna (1955) from soil and two from gorse flowers by Van Uden (1956). In our observations the yeast was obtained from the bedding straw, as a single colony from the air of the piglet pen and in quantity from the drinking water into which a considerable amount of the creep feed had fallen. Extensive attempts by one of us (P. K. C. Austwick) to obtain isolations of this yeast from the bedding, food, water, and air in another outbreak of moniliasis in young pigs (Osborne, 1958) were entirely unsuccessful although several other species of yeasts were recovered. These isolations of *Candida albicans* indicate the possibility of exogenous transmission, a concept which may be of great importance in the study of both human and animal moniliasis.

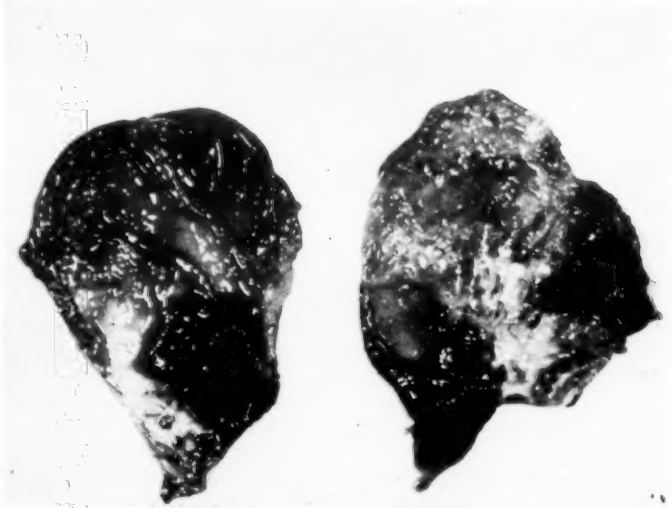


FIG. 1.—Stomach lesions of case Nos. 3 and 4. x 4/5.

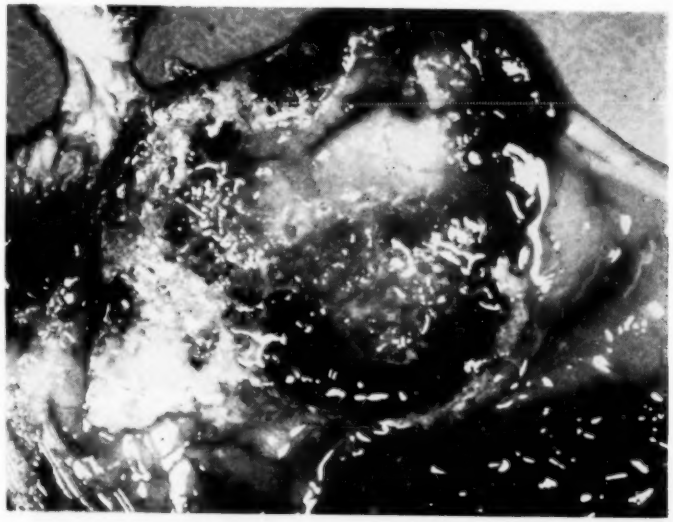


FIG. 2.—Stomach lesion of case No. 6. x 1.

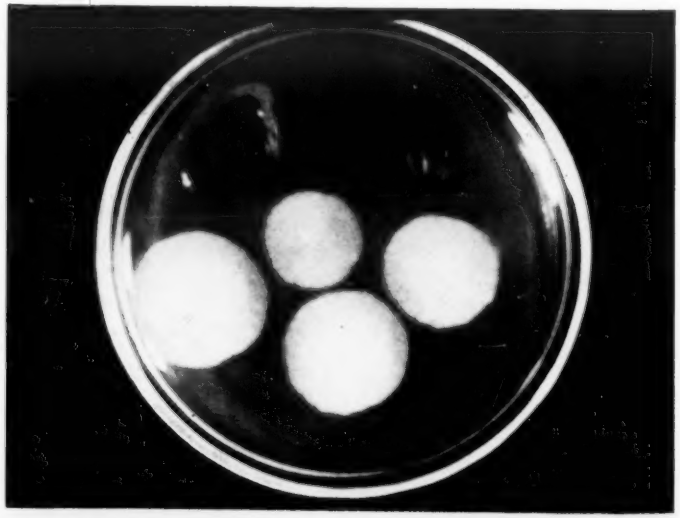


FIG. 3.—*Rhizopus microsporus* growing from dissected hyphae and incubated 16 hours on 2 per cent. malt agar at 37° C. x ¾.

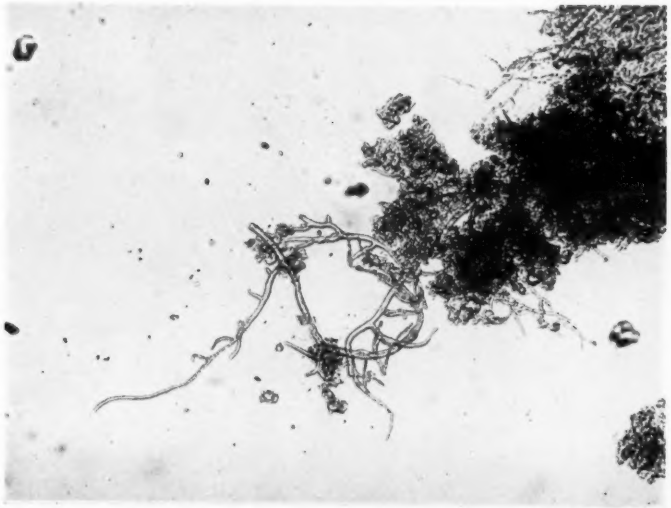


FIG. 4.—Hyphae in teased fragments from centre of the lesion. x 160.

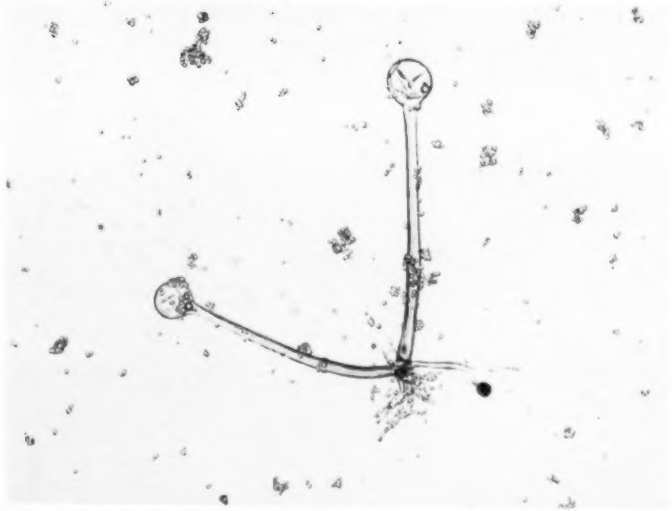


FIG. 5.—Sporangiophores of *Rhizopus microsporus* with columellae. 24 hours' incubation on 2 per cent. malt agar at 37° C. x 100.

FIG. 6.—Margin of the gastric ulcer from case No. 6; stained H. & E. x 25.

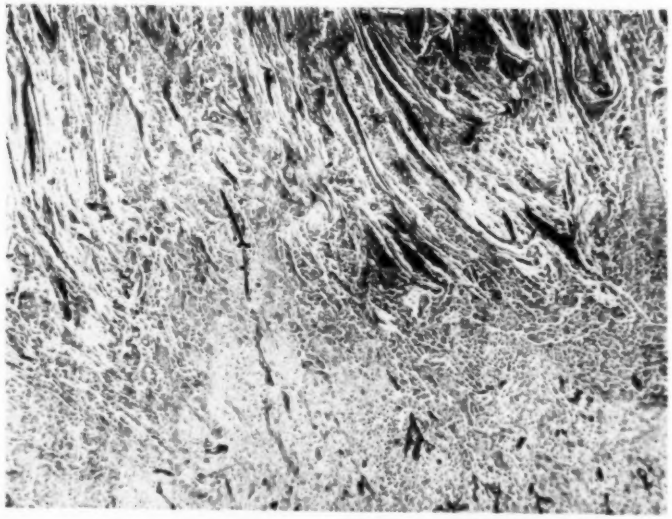


FIG. 7.—Hyphae invading the gastric mucosa; stained P.A.S. x 100.

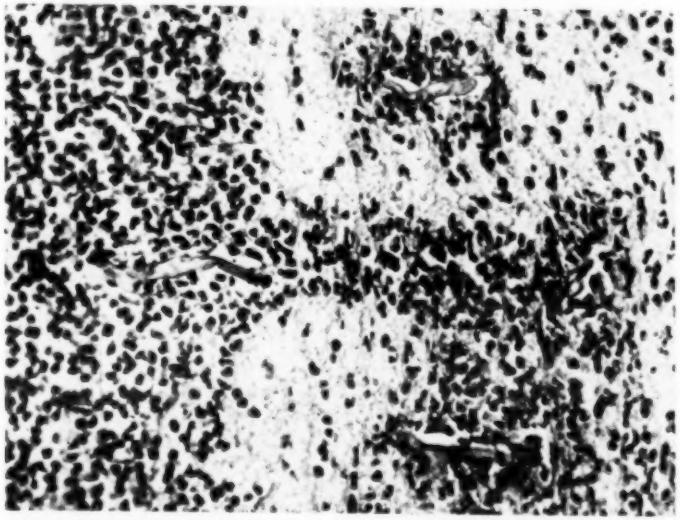


FIG. 8.—Cellular reaction around hyphae invading sub-mucosa of case No. 1; stained H. & E. x 300.

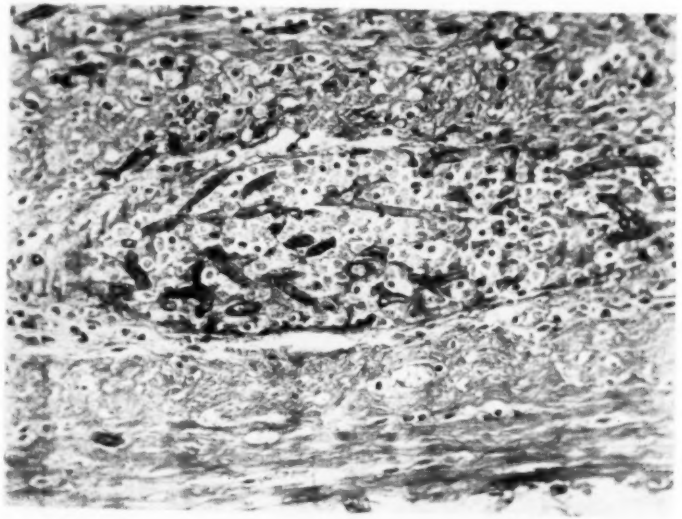


FIG. 9.—Hyphae in a thrombosed sub-mucosal vessel; stained P.A.S. x 300.

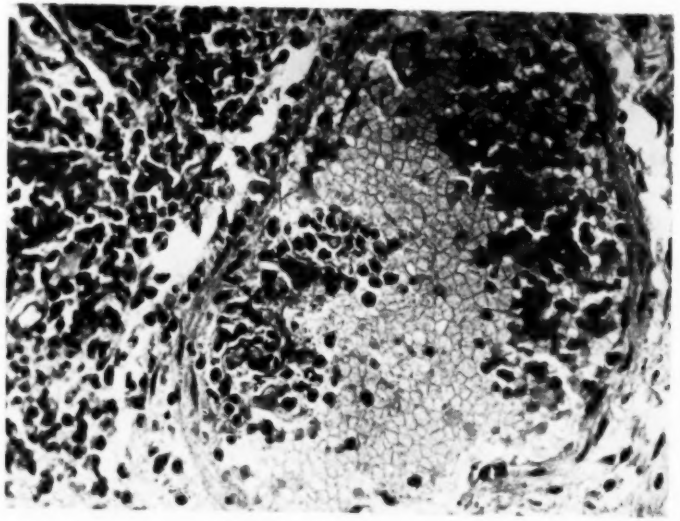


FIG. 10.—Cellular reaction around the hyphae in a thrombosed vessel; stained H. & E. x 300.

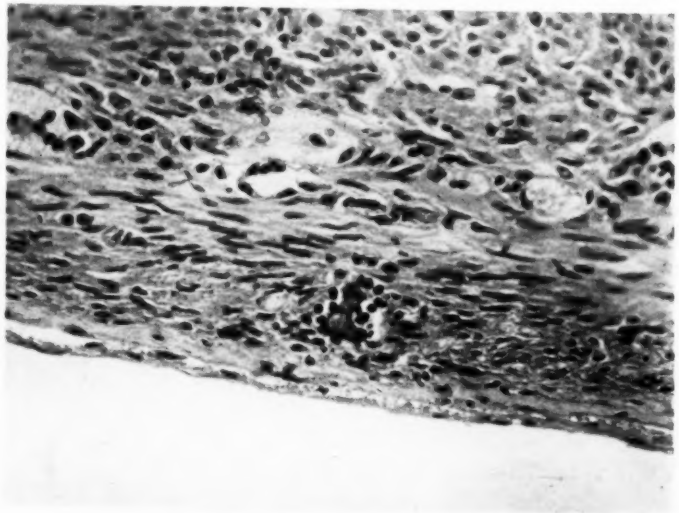


FIG. 11.—Hyphal penetration reaching serosa in case No. 2; stained H. & E. x 300.

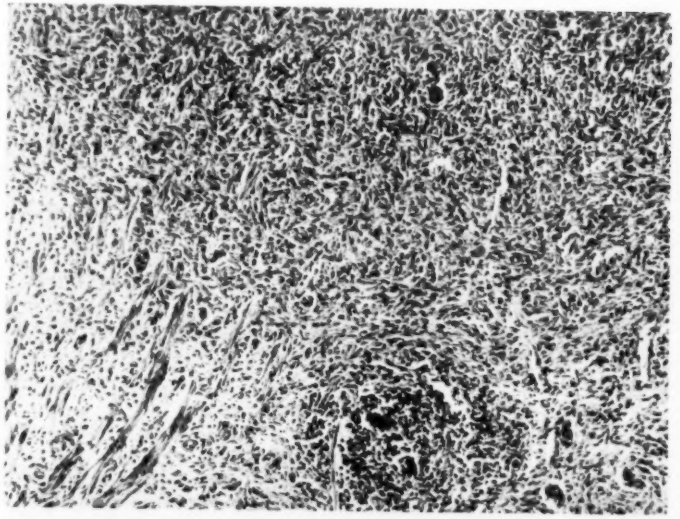


FIG. 12.—An infective granuloma and Langhans' type giant cell in case No. 5; stained H. & E. x 100.

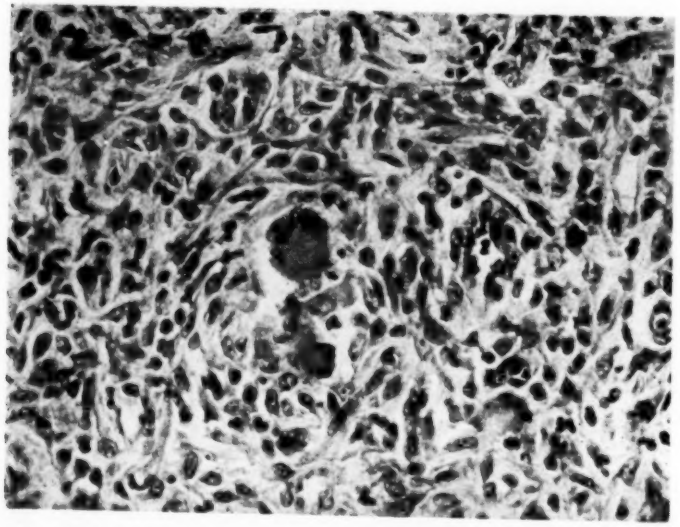


FIG. 13.—Langhans' type giant cell with a hypha in nuclei-free zone of the cell; stained H. & E. x 450.

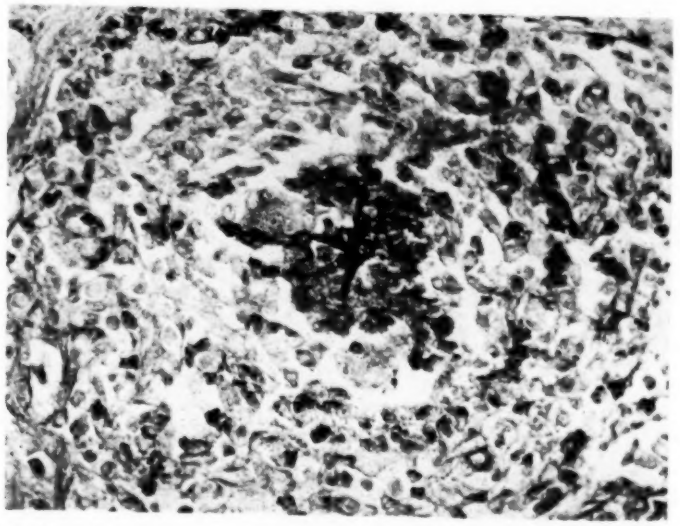


FIG. 14.—Hyphae at the centre of a granuloma in case No. 5; stained P.A.S. x 450.

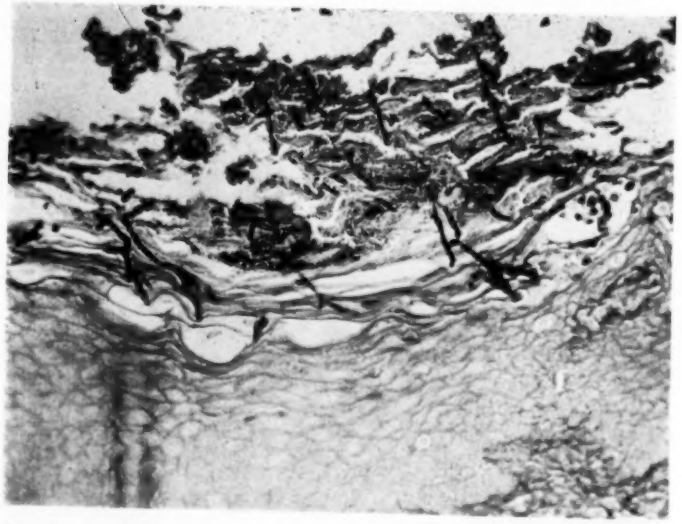


FIG. 15.—Oesophageal zone of the stomach of No. 5 showing superficial penetration by pseudohyphae of *C. albicans*; stained P.A.S. x 300.

FIG. 16.—*C. tropicalis* in the stomach contents of case No. 6; stained P.A.S. x 300.

This outbreak enables an interesting comparison to be made between infection by *Rhizopus microsporus*, a mucoraceous fungus, with that of *Candida albicans*, an imperfect yeast. While the yeast cells and pseudomycelia were present only in stratified squamous epithelium, the mucoraceous hyphae were found only in the glandular parts of gastric mucosa. In our previous paper we described how at the junction of the glandular and non-glandular parts of calf's abomasum the mucoraceous hyphae were seen penetrating vertically the former, but invading the latter only under and parallel to the intact stratified squamous epithelium. In this connexion the keratinolytic properties of *Candida albicans* in the presence of glucose demonstrated by Kapica and Blank (1957) are of considerable significance. Similar properties have never been demonstrated in a mucoraceous fungus.

Probably one of the most important findings in this outbreak has been the isolation of *Rhizopus microsporus* from the lesions. This appears to be the first time isolations have actually been made from mucormycotic ulcers. The specific inflammatory reaction produced by mucoraceous fungi is a clear indication that they are of pathogenic significance but proof of their primary or secondary rôles must await experimental evidence which now may be facilitated by the isolation of a known species from what appears to be a primary lesion.

Acknowledgments.—To Mr. J. F. Fawcett for bringing the outbreak to our notice and for facilitating the field investigation; to Mr. A. Shand for his suggestions on the manuscript; to Mrs. J. D. Cartner for technical assistance; and to Mr. E. Clements for the photomicrographs.

References

BAKER, R. D. (1957). *J. Amer. Med. Ass.* **163.** 805-8.
BENDIXEN, H. CHR., & PLUM, N. (1929). *Acta. Path. Microb. Scand.* **6.** 252-322.
CHRISTIANSEN, M. (1922). *K. Vethojsk. Aarsskr.* 133-90.
———. (1929). *Virchow's Arch.* **273.** 829-58.
DAVIS, C. L., ANDERSON, W. A., & MCCROY, B. R. (1955). *J. Amer. Vet. Med. Ass.* **126.** 261-7.
DONE, J. T., RICHARDSON, MARION D., & AUSTWICK, P. K. C. (To be published).
GITTER, M., & AUSTWICK, P. K. C. (1957). *Vet. Rec.* **69.** 924-8.
HOOGLAND, H. J. M. (1932). *Tijdschr. Diergeneesk.* **59.** 1,156-63.
KAPICA, L., & BLANK, F. (1957). *Dermatologica.* **115.** 81-105.
KRETZSCHMAR, Ch. (1954). *Monat. F. Vet. Med.* **12.** 274-8.
MENNA, M. E. DI (1955). *J. gen. Microbiol.* **12.** 54-62.
OSBORNE, A. D. (1958). Private communication.
PALLASKE, G. (1939). *Tierarztl. Rdsch.* **45.** 601-3.
TSCHERNIAK, W. S. (1934). *Z. Infektbr. Haustiere.* **44.** 72-80.
———, MARAEV, P. V., & GUSEV, A. A (1937). Sborn. Rab. Leningrad Vet. Inst. 9-27.
UDEN, N. VAN, MATOS FAIA, M. DE, & ASSIS-LOPES, L. (1956). *J. gen. Microbiol.* **15.** 151-3.
VINK, D. H. (1941). *Tijdschr. Diergeneesk.* **68.** 312-3.
WALKIEWICZ, W. (1934). *Wiad. Weteryn.* **170.** 449-63.
WATSON, K. C. (1957). *S. A. Med. J.* **31.** 99-101.

A Non-return Valve for Use with Semi-closed Anaesthetic Techniques

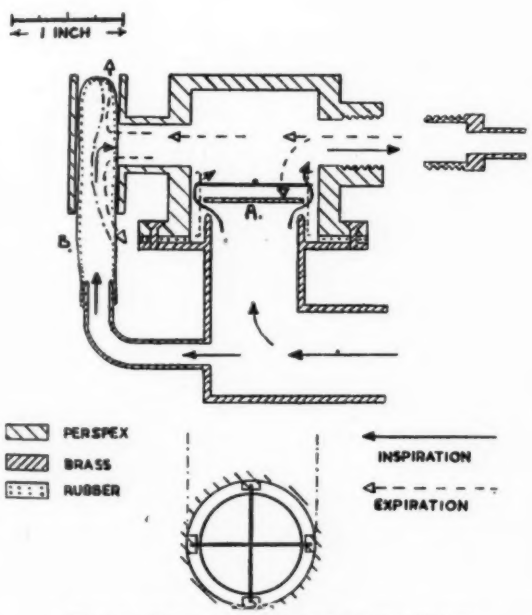
BY

BARBARA M. Q. WEAVER

Department of Veterinary Surgery, University of Bristol

THIS valve was designed for use with a continuous flow anaesthetic machine, administering inhalational anaesthetic agents and oxygen by the semi-closed method. Other valves are in use, with mechanical respirators and resuscitators as well as anaesthetic circuits which, while they differ in working principle, are all designed to prevent rebreathing of expired air. These valves include the Cardiff inflating valve (Mushin, 1953), the Flutter type expiration valve, used with the Radcliffe respirator, the American Emerson valve, and the Ruben valve (Ruben, 1955). This latter valve is Danish and has recently been introduced into anaesthetic practice in this country.

The principle of the working of this valve is shown in the diagram (Fig. 1). During expiration the uni-directional valve disc (A) prevents the expired gases and vapours from re-entering the corrugated delivery tube. Moreover, during inspiration or positive pressure inflation of the lungs, the expiratory outlet of the valve is occluded by the simultaneous inflation of a small rubber balloon (B). This valve has a dead space of 20 c.c.; accordingly, it is fitted as close to the animal as possible.



PLAN OF GUIDES FOR UNI-DIRECTIONAL VALVE

FIG. 1.—A non-return valve for use with semi-closed anaesthetic techniques.

The use in anaesthetic practice of a valve of this type, *i.e.* one which does not permit re-breathing of expired gases, can be an advantage in the following ways :—

1. In contrast to the usual practice with the standard Heidbrink expiratory valve, the gas flow does not need to exceed the minute volume in order to ensure that all expired gases are carried away to the atmosphere. There is, in consequence, a considerable economy of gases.

2. If the animal is fitted with an air-tight facepiece, or a cuffed endotracheal tube, then in order to keep the volume of the reservoir bag constant for each phase of the breathing cycle, the gas flow must be adjusted to equal the minute volume of the animal. This means that by recording the respiratory rate, the animal's tidal volume can be readily assessed.

3. Respirations can be controlled, should this become necessary or desirable, by manual compression of the reservoir bag. Since there will still be no re-breathing of expired air, there is no risk of carbon dioxide accumulation, and the need for carbon dioxide absorption by soda lime is avoided. This can be an advantage in animals, because the inclusion of soda lime in the circuit increases resistance to respiration and, with the great variation in size and shape of the patients, it is not often possible to use the correct size soda lime canister (*i.e.* one that contains exactly the tidal volume of the animal, when filled with soda lime granules). Furthermore, there is no heat retention as occurs in a closed circuit; this can prove troublesome, particularly in hot weather (Hall & Weaver, 1954).

This valve has been used mainly on dogs and cats (see Fig. 2). It was constructed in the Physiology Department of the Royal Veterinary College by Mr. V. C. Tindley, and was used in the first instance in the Beaumont Animals' Hospital.

Acknowledgments.—The author wishes to acknowledge the encouragement and help of Professor E. C. Amoroso, F.R.S., in the construction of the valve and in the preparation of this paper. In addition, her thanks are due to Professor C. Formston and Mr. G. C. Knight, for the facilities they provided for the use of this valve in the Department of Surgery at the Royal Veterinary College, and to Professor A. Messervy for the provision of similar facilities in the Department of Veterinary Surgery, University of Bristol.

The working diagram of the valve was made by Mr. V. C. Tindley and photographed by Mr. R. S. Undrill; the photograph of the valve in use was taken by Mr. M. Parsons in the Department of Veterinary Surgery, University of Bristol.

References

MUSHIN, W. W. (1953). *Brit. Med. J.* ii. 202.

RUBEN, H. (1955). *Anaesthesiology.* **16**. 643.

HALL, L. W., & WEAVER, B. M. Q. (1954). *Vet. Rec.* **66**. 289.

Addendum

Since completing this article, the author has noted with interest that a valve having a similar working principle has been described by F. G. Etheridge, in *The British Journal of Anaesthesia*, 1958, volume 30, page 245.

FIG. 2.—Non-return valve seen in use on a Pekingese dog.

Abortion of a Woolly Monkey (*Lagothrix lagotricha*) Possibly Associated with Brucellosis

BY

W. M. BRANCKER
Sutton Coldfield

AND

R. N. T-W-FIENNES
Zoological Society of London

SUMMARY.—1. Hill (1957) recorded the only known case of a pregnancy in a Humboldt's Woolly Monkey (Lagothrix lagotricha) *in captivity. This pregnancy terminated in abortion at 3 months (gestation period probably 4½ to 5 months).*

2. This same monkey aborted a second foetus in March, 1958, and the clinical history of the case is described.

3. The serum of the foetus agglutinated both Brucella melitensis *and* Br. abortus *in a titre of 1 : 250.*

4. The possibility that the abortions were associated with brucellosis is discussed.

General

HILL (1957) recorded the unusual (probably unique) event of conception by a captive Woolly Monkey, one of a pair owned by Miss Molly Badham, F.Z.S., of Hints, Staffordshire. Hill described the foetus and foetal membranes and gave the history of conception and abortion. The foetus was estimated to be of 3 months and the gestation period of the Woolly Monkey 4½ to 5 months.

Clinical Studies

The monkey came under the medical care of one of us (W.M.B.) and was treated with progesterone and stilboestrol tablets, on the assumption that abortion was due to hormonal deficiency; this treatment was started at the end of May, 1957, when copulation began. Copulation continued all summer and the treatment was discontinued. Treatment was not resumed as had been intended and it was not realised that the monkey was pregnant until a few days before the second abortion during the second week of March, 1958.

When threatened abortion was observed, an attempt was made to save the foetus by an injection of progesterone. However, a few hours later, when the monkey was unattended at night, abortion took place without complete separation and a severe haemorrhage resulted. Manual removal of the foetal membranes was comparatively easy and no haemorrhage was seen subsequently. Although reasonably bright, the monkey suffered from very severe anaemia and collapsed and died the following day in spite of treatment.

Laboratory Studies

The foetus and membranes were sent to the pathological laboratories of the Zoological Society of London for study. Here cultures were made from the blood of the foetus and the gut; serum from the foetus was used for agglutination testing. Results were as under:—

Gut Cultures. Gut cultures yielded only *Pseudomonas aeruginosa* and *Clostridium aerofoetidum*, both of which in the circumstances of the case should be regarded as non-pathogenic.

Blood Cultures. Pseudomonas aeruginosa was isolated also from the blood, which was probably invaded from the gut *post mortem*.

Blood cultures were also incubated in an atmosphere of 10 per cent. CO_2. These cultures were unfortunately overgrown with Proteus sp. to such an extent that it was not possible to separate other organisms present. The cultures, however, produced a large volume of H_2O, a reaction consistent with the presence of Brucella sp., but which would not be associated with Proteus sp..

Agglutination Tests. The foetal serum failed to agglutinate Salmonella or Vibrio antigens. *Brucella melitensis* was agglutinated 1:250 and *Br. abortus* 1:250.

Discussion

This case presents a number of points of interest. That the first pregnancies amongst these monkeys in captivity should result in two successive abortions and the loss of the female was a disappointing result. Unfortunately, it is a not unusual experience in captive wild animals, amongst which abortion is one of the impediments to successful breeding.

Such abortions are usually attributed to hormonal deficiencies or to psychological causes associated with captivity. Few attempts have, however, been made to study either the causes of abortion or indeed any other aspect of the problem of breeding wild animals in captivity. The practitioner in treating such cases is, therefore, in the dark and must take what steps appear most likely to be effective.

In the present case, the cause of the abortion is not clear. Had the intended course of hormonal treatment been given during pregnancy, and had abortion then still taken place, the issue would be clearer. The results of the bacteriological tests indicate that the monkey had been—and probably still was—infected with *Brucella melitensis* or *Br. abortus*. Whether infection with these organisms can lead to abortion in Platyrrhine Monkeys is not known. The results, however, indicate that such an infection must be considered as a possible cause in the case of abortion amongst Primates other than *Homo sapiens*.

Reference

HILL, W. C. OSMAN. (1957). "Captive Born Foetus of Woolly Monkey (*Lagothrix lagotricha*)." *Proc. Zool. Soc. Lond.* **129.** 447—9.

Current Literature

BOOK REVIEWS

Poisoning by Drugs and Chemicals: An Index of Toxic Effects and their Treatment. By P. COOPER, F.P.S. (1958). Alchemist Publications, London. Pp. 209. 25s.

This pocket book is designed for the physician and the pharmacist. It consists of a series of brief monographs on drugs, chemicals, and poisonous plants which cause poisoning in man. Each monograph gives synonyms, and normal doses where applicable, with notes on the action, absorption and excretion, toxic effects, suggested treatment, and aids to identification. There is a short appendix dealing with first aid measures and a satisfactory index.

Vade-Mecum du Vétérinaire. By A. BRION (1958). Vicot Frères, Paris. 10th ed. Pp. 752. 4,200 fr.

Professor Brion is professor of the medical clinic at the Alfort veterinary school. Nearly half the text of this book is taken up by a veterinary materia medica, the remainder consists of notes on prescribing, forensic pharmacy, the administration of drugs, therapeutics, notifiable diseases, nutrition, reproduction, euthanasia, and laboratory diagnosis. This comprehensive manual is obviously intended for the veterinary student and the veterinary surgeon in practice in France. The materia medica section is necessary as there is no French equivalent of the British Veterinary Codex.

It is interesting to compare French and British methods. For example, the production of an artificial abscess, by the subcutaneous injection of turpentine oil, is suggested in the treatment of respiratory disease. Again, it is suggested that the umbilical cord of the calf should be ligated at birth, and that after division the stump should be dressed with iodine. In the section on euthanasia in the dog the following methods are suggested: strychnine sulphate solution by intrathoracic injection, intravenous magnesium sulphate solution, and electricity. No mention is made of the value of pentobarbitone sodium injections for euthanasia.

The "Vade-Mecum du Vétérinaire" is similar in concept to our own Banham's "The Veterinary Surgeon's Vade Mecum," and presumably it is as frequently consulted in France as is its English counterpart in this country.

BOOKS RECEIVED

Newsom's Sheep Diseases, by Hadleigh Marsh. 2nd ed. Pp. xiv + 406. Illustrated. Baillière, Tindall & Cox Ltd. 72s.

Food Microbiology, by W. C. Frazier. London: McGraw Hill Publishing Co. 70s.

The World's Best Horse, by Lady Wentworth. London: G. Allen & Unwin. 50s.

Metabolism of Sulphur Compounds, by Leslie Young and George A. Maw. London: Methuen & Co. 16s.

Parasitic Animals, by G. Lapage. Cambridge: W. Heffer & Sons Ltd. 25s.

ABSTRACTS

The Sensitivity of *Vibrio fetus* to Streptomycin and the Emergence of Resistant Mutants. MORGAN, W. J. B. (1958). *J. Gen. Microbiol.* **19.** 517.

Forty-five strains of *Vibrio fetus*, most of them isolated from the vaginal mucus of infected heifers during diagnostic work, were tested for sensitivity to streptomycin by tube and plate methods. Of the strains, 39 were deemed sensitive, being inhibited by concentrations of streptomycin from 0.5 to 20 μg. per ml. Streptomycin-resistance was found in the remaining 6 strains. The character of the results obtained with the 6 resistant strains in both tube and plate tests indicated that their resistance was associated with the presence within them of a small number of organisms that were streptomycin-resistant. By the replicate plating technique of Lederberger it was shown that this resistance in one of the strains was, in fact, due to spontaneous mutation occurring in the absence of streptomycin.

[*Abstractor's Note.* In view of the continued widespread use of streptomycin in semen used for artificial insemination, it would be interesting to see the result of similar surveys conducted in future years.]

H. W. S.

Activity of Chemical Compounds Against Experimental Tetanus. LAURENCE, D. R., & WEBSTER, R. A. (1958). *Brit. J. Pharmacol.* **13** (3). 334.

The authors have undertaken a survey of central nervous depressants in order to find those drugs which will control tetanic convulsions most effectively without causing either loss of consciousness or respiratory depression. Preliminary tests on localised tetanus in the gastrocnemius muscle of the rabbit with mephenesin, thiopentone, betanaphthoxyethanol, and chlorpromazine showed that the last drug had by far the greatest antitetanic activity. Accordingly, further tests were carried out on chlorpromazine and 3 other drugs of the same (phenothiazine) group, namely acetylpromazine, promazine, and promethazine, and of these acetylpromazine showed the greatest activity.

I. W. J.

Trolene (Dow E.T. 57) Trial 1957-8. KERRY, J. E., & THORNBERRY, H. (1958). *Irish Vet. J.* **12.** 198.

One- to two-year-old bullocks and heifers were drenched with a suspension of O, o, dimethyl 0-2, 4, 5 trichlorophenyl phosphorothioate* to control Hypoderma larvae. A single dose was given at 100 mg. per kg. in November, 1957, and no evidence of toxicity was reported after treatment. Larvae counts on 4 occasions from March onwards showed that in the 113 control animals 2,080 larvae were present compared with 724 in the 108 treated animals. This control is not as high as in some reported trials.

W. M. B.

* Trolene Dow E.T. 57.

News and Comment

THE ESTABLISHMENT OF THE WORLD REFERENCE LABORATORY FOR FOOT-AND-MOUTH DISEASE

Increasing attention is being given on an international basis to the control and ultimate eradication of foot-and-mouth disease and one of the recent steps taken following negotiations between the Food and Agriculture Organisation of the United Nations and the British Government has been the establishment of a World Reference Laboratory for Foot-and-Mouth Disease at the Pirbright Research Institute, which functions under the aegis of the Agricultural Research Council.

The Institute has already a wide experience in the examination of virus material from all over the world during the past 10 years. Last May, at the XXIst Session of the Office International des Epizooties, Paris, the Institute reported the results of the examination and classification of 2,200 virus materials from outbreaks in 43 countries in Europe, Africa, Asia, and the Americas. During the period 1948-58, the epizootiological surveys of the Institute revealed 4 additional immunological types of the virus, 3 in Africa designated S.A.T.1, S.A.T.2., and S.A.T.3, and ASIA 1 in Asia. The well-known O, A, and C types (1922-6) were found in Europe, the Americas, Asia, and Africa.

F.A.O. has sought the co-operation of governments so that this valuable pioneer work can be continued and extended by arranging for the continued collection and despatch to the W.R.L. now established, of suitable field samples from outbreaks of the disease from countries all over the world. There is a very great advantage in having a central reference centre to collect information on the distribution of virus types responsible for outbreaks, sporadic, enzootic, and epizootic, and to complete surveys by collecting all essential information. It will be of much value in organising methods of control and eradication and in assisting countries to estimate risks associated with trade. Control programmes in many parts of the world include vaccination and an essential to make these effective is accurate information on types and strain differences so that appropriate vaccines can be used. The virus of foot-and-mouth disease, unlike those of yellow fever, rabies, and rinderpest, lacks antigenic homogeneity. There are at present 7 immunological types of the virus and it is possible that other types of the virus may be discovered as the result of more extended surveys (*cf.* 3 in poliomyelitis, 3 in influenza, 3 in equine encephalomyelitis, and 2 in vesicular stomatitis). There are in addition strains of the virus within each main immunological type group which differ sufficiently in antigenic constitution to classify them as sub-types. There is justification for continued investigation by the World Reference Laboratory of the sub-type problem from the point of view of detailed immunological comparison of strains in relation to epizootiological studies and vaccination.

The functions of the World Reference Laboratory will include as well the examination and classification of virus types and sub-types, the ultimate establishment of a collection of all types and confirmed sub-types and their corresponding sera. It will give also all possible assistance if specially requested to do so to countries in Europe and the Americas which have already typing facilities, will be dealing with sub-type classification and be responsible for the examination and identification of strains of virus suspected to be other than types 0, A, and C.

The Institute already prepares type specific sera for the 7 types of the virus of foot-and-mouth disease, the 2 types of the virus of vesicular stomatitis and has available also for differential diagnostic purposes homotypic sera for the 9 immunological types of vesicular exanthema and when the classification of sub-types has been completed, stocks of the corresponding antisera will be maintained to supply other countries on request.

NEW R.V.C. PROFESSOR APPOINTED

Dr. J. A. Laing, Reader in Veterinary Science at the University of Bristol School of Veterinary Science, has been appointed to the Courtauld Chair of Animal Husbandry and Veterinary Hygiene at the Royal Veterinary College in the University of London. The Chair was made vacant by the death, last year, of Professor N. J. Scorgie. It is hoped to publish a biographical note on Professor Laing next week.

THE ROYAL COLLEGE OF VETERINARY SURGEONS

The undermentioned were admitted to membership of the Royal College on the dates indicated:—

ALI, Sadiq, College of Animal Husbandry, Lahore Pakistan, December 13th, 1958, London, B.V.SC. (PUNJAB); ATOCK, Martin Alexander, 44, Arlesbury Road, Dublin, December 10th, 1958, Dublin; BARRETT, Joseph Nicholas, Elm Green, Castleknock, Co. Dublin, December 10th, 1958, Dublin; BERRY, John Paul, Duncormick, Co. Wexford, December 10th, 1958, Dublin; BLATCHER, Richard Brian, Forest View, Westbourne Terrace, Budleigh Salterton, Devon, December 13th, 1958, B.A., VET.M.B. (CANTAB); CORRY, Daniel Michael Gerard, Drumlargan, Palmerstown, Co. Dublin, December 10th, 1958, Dublin; COX, Edward, Corlurgan, Bailieboro, Co. Cavan, December 10th, 1958, Dublin; DELAHUNTY, Daniel Alworth House, Abbeyleix, Co. Leix, December 10th, 1958, Dublin; DOLAN, Terence Cecil, Shannon Lodge, Carrick on Shannon, Co. Leitrim, December 10th, 1958, Dublin; DOWLING, William Anthony, Turtulla, Thurles, Co. Tipperary, December 10th, 1958, Dublin; DOYLE, Ian McLean, Owenmore, Newtownpark Avenue, Blackrock, Co. Dublin, December 10th, 1958, Dublin; HANNIGAN, John Hugh, 105, Cromwells Fort Road, Dublin, December 10th, 1958, Dublin; HERNON, John, Jubilee Hall, Bray, Co. Wicklow, December 10th, 1958, Dublin; HOLLOWAY, Aiden Bernard, 47, Sandymount Road, Dublin, December 10th, 1958, Dublin; IFFY, Judith (Mrs.), 37, Exeter Road, London, N.W.2, December 13th, 1958, Cambridge; LYDON, Charles Thomas John, Thornhill Lodge, Westport, Co. Mayo, December 10th, 1958, Dublin; MCKERVEY, James Hugh Cormac, Ederney, Co. Fermanagh, December 10th, 1958, Dublin, MOLONEY, Richard, Castletown Roche, Mallow, Co. Cork, December 10th, 1958, Dublin; O'BRIEN, Thomas Joseph, St. Ruth's Milltown,

Athlone, Co. Roscommon, December 10th, 1958, Dublin; O'LEARY, Michael, Clondrohid, Macroom, Co. Cork, December 10th, 1958, Dublin; O'REILLY, Daniel Joseph, Norwood, Sidmonton Road, Bray, Co. Wicklow, December 10th, 1958, Dublin; REIDY, Daniel Francis, Kilmallock, Co. Limerick, December 10th, 1958, Dublin; SWEETMAN, William Laurence, Ballymacherry House, Clonroche, Co. Wexford, December 10th, 1958, Dublin; SZEP, Gasper, 30A, Mill Road, Cambridge, December 13th, 1958, Cambridge; WILSON, Robert William, Castle Avenue, Castlewellan, Banbridge, Co. Down, December 10th, 1958, Dublin; and YUSUF, Muhammad, c/o College of Animal Husbandry, Lahore, West Pakistan, December 13th, 1958, Liverpool. B.V.SC. (PUNJAB).

XVI INTERNATIONAL VETERINARY CONGRESS, MADRID

We are asked to remind those who intend to be present at the Congress that enrolment fees should be sent to the Treasurer in good time. Advance copies of papers cannot be sent until fees have been paid, and a receipt for the fees will entitle delegates to receive further literature when they arrive in Madrid. No advance literature can be sent after March 31st, and fees, therefore, should be paid fairly well before this date.

In connexion with the Congress there will be a photographic competition open to delegates. Photographs, which may be in black and white or in colour, should be enlarged to the size of 24 in. by 18 in. and two prints should be sent, each having a typewritten caption. The subject matter should, of course, be of veterinary interest and the prints should be addressed to:—

Secretaría General del XVI Congreso Mundial de Veterinaria, Villanuea, 11, Madrid, Spain.

These are returnable C.O.D. or may be claimed at the end of the Congress.

Professor Carda, General Secretary of the Congress, has now notified us that the 600-word communications may, in fact, be delivered with a few more words than this number. However, nothing will be printed other than a 600-word summary. It is hoped that time will be allowed for the showing of essential lantern slides, transparencies, etc.

UNIVERSITY OF LONDON LECTURES

As a part of the scheme of interchange of British and Swedish lecturers, a course of two lectures will be given under the auspices of the University of London by Dr. B. Andersson, Reader in Veterinary Physiology in the Royal Veterinary College, Stockholm. The lectures will be delivered in the Royal Veterinary College, London, on March 3rd at 5 p.m., and on March 4th at 12 noon. The titles will be: *The Hypothalamus and the Internal Environment*, and *Thirst and Factors Controlling Drinking*.

For the first lecture the chair will be taken by Professor F. R. Winton, M.D., D.SC., Professor of Pharmacology in the University of London. Admission is free to students and others interested, and no tickets are required.

UNIVERSITY NEWS

Bristol

FINAL EXAMINATION FOR THE DEGREE OF B.V.Sc.

(SECTION I)

PASS

Amodu, Agboola Adebayo; Bainbridge, Joseph Robert; Betteridge, Keith James; Butler, Wallace Frederick (with distinction in Public Health); Charleston, William Anthony George; Cooper, Elizabeth Sally Ann; Davies, Gareth; Halhead, William Anthony; Kon, Wanda Mary; Lea, Keith; Lucke, Jeremy Newton; Mason, Thomas Alfred; Mercer, Ann Julie; Newman, Michael Anthony Hust; Pavord, Antony Dwelly; and Phillips-Jones, David Michael.

(SECTION II)

PASS

Chapman, Richard Hereward; Crittall, John Lawrence White; Davies, Thomas Hicks Roberts; Jowett, George David; Prior, Michael Geoffrey; Swan, Bernard Anthony Kavanagh; Watts, Michael Edwin Thomas; Westaway, Arthur John; and Yarrow, Thomas Goodwin.

Glasgow

DEGREE OF B.V.M.S.

Second Professional Examination (Part II)

The following Passes are announced in the subjects of veterinary physiology and biochemistry: Abraham, J. A.; Alexander, G. F.; Atang, P. G.; Crawford, I; Dabell, J. S.; Dawe, P. S.; Evans, J. I.; Ferguson, D. A.; Heeley, R. M.; Hodges, T. G. G.; Hughes, R. E.; Ingram, J. F. W.; McLelland, J.; Miller D. J. S.; Miller, T. A.; Mollison, A.; Morrison, A. N.; Peek, I. S.; Richards, R. S.; Russell, T. M.; Saunders, R. W.; Selman, I. E.; Smeaton, P. D.; Todd, J. N.; Wheeldon, A.; Wilson, R. J. W.; Wishart, D. F.; and Young, R. G. E.

The following Passes are announced in the subjects of veterinary histology and embryology, and anatomy: Abraham, J. A.; Alexander, G. F.; Atang, P. G.; Crawford, I.; Dabell, J. S.; Evans, J. I.; Ferguson, D. A.; Heeley, R. M.; Hodges, T. G. G.; Ingram, J. F. W.; McLelland, J.; Miller, T. A.; Mollison, A.; Morrison, A. N.; Peek, I. S.; Richards, R. S.; Russell, T. M.; Saunders, R. W.; Selman, I. E.; Smeaton, P. D.; Todd, J. N.; Wheeldon, A.; and Wishart, D. F. (distinction in Anatomy).

Final Examination

The following Passes are announced for the B.V.M.S. final examination: Cameron, I. D.; Hogan, D.; Lopathin, I.; and Pottie, A. D.

Liverpool

Degree of B.V.Sc.

Second Examination, PART I.—VETERINARY ANATOMY (INCLUDING HISTOLOGY AND EMBRYOLOGY)

Arnott, J. N.; Carter, D.; Cotgreave, D. H.; Dunton, J.; Edwards, G. B.; Giam, C. H.; Harding, A. J.; Horrocks, Susan; Kemble, P. R.; Kennington, D. A.; Littlewood, H. F.; Llewellyn, G.; Love-Jones,

H.; *Maclean, C. W.; Malone, J.; Strawbridge, G. E.; Waugh, I. R.; Weinberg, R.; Whittaker, J. F.; Williams, G. V.

* Passed with distinction in Histology.

PART II.—PHYSIOLOGY (INCLUDING BIOCHEMISTRY)

*Arnott, J. N.; Carding, A. H.; Carter, D.; Cotgreave, D. H.; Dunton, J.; Edwards, G. B.; Giam, C. H.; Green, P. B.; Harding, A. J.; Horrocks, Susan; Kemble, P. R.; Kennington, D. A.; *Littlewood, H. F.; Llewellyn, G.; Love-Jones, H.; *Maclean, C. W.; Malone, J.; Strawbridge, G. E.; Waugh, I. R.; Weinberg, R.; *Whittaker, J. F.; Williams, G. V.

* Passed with distinction in Biochemistry.

PERSONAL

Births

BEESLEY.—On December 20th, 1958, at the Warneford Hospital, Leamington Spa, to Constance (*née* Keable), wife of Colin J. Beesley, M.R.C.V.S., a daughter, Gillian.

FISHWICK.—On December 9th, 1958, at Saxmundham, Suffolk, to Cynthia, wife of Roy Fishwick, M.R.C.V.S., a son, brother for Peter and Susan.

HUGHES.—On December 25th, 1958, to Lesley, wife of Ian B. Hughes, B.V.SC., M.R.C.V.S., of Ripon, Yorkshire, a son, Michael John.

KETTLES.—On December 16th, 1958, at the Firs Maternity Hospital, to Christine (*née* Balfour), wife of Andrew S. Kettles, B.SC., M.R.C.V.S., of 9, Weardale Road, Nottingham, a daughter, Carron.

COMING EVENTS

January

8th (Thurs.). Additional Meeting of the Central Veterinary Society at the Royal Veterinary College, Camden Town, N.W.1, 6 p.m.

16th (Fri.). Annual General Meeting of the Mid-West Veterinary Association at the Berkeley Café, Clifton, Bristol, 2.15 p.m.

21st (Wed.) 10th Anniversary Dinner-Dance of the Centaur Society at the Berkeley, Bristol.

Meeting of the Warwickshire Veterinary Club in the Regent Hotel, Leamington Spa, 8 p.m.

30th (Fri.). Annual Ball of the Royal (Dick) School of Veterinary Studies in the Assembly Rooms, George Street, Edinburgh, 9 p.m.

Annual General Meeting of the Yorkshire Veterinary Society in Leeds.

February

11th (Wed.). Annual General Meeting of the Society for the Study of Animal Breeding at the Royal Society of Medicine, 1, Wimpole Street, W.1.

BRITISH VETERINARY ASSOCIATION QUARTERLY MEETINGS IN JANUARY

Tuesday, January 20th, 1959—At No. 7, Mansfield Street

5.30 p.m. Finance Sub-committee.

Wednesday, January 21st, 1959—At No. 7, Mansfield Street

10.00 a.m. Veterinary State Medicine Committee.
11.30 a.m. Home Appointments Committee.
2.00 p.m. Small Animals Committee.

Thursday, January 22nd, 1959—At No. 7, Mansfield Street

10.00 a.m. Parliamentary and Public Relations Committee.
11.30 a.m. Farm Livestock Committee.
2.15 p.m. General Purposes and Finance Committee.

Friday, January 23rd, 1959—At The Connaught Rooms, Gt. Queen Street, W.C.2

11.00 a.m. Council Meeting.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Berks. College Farm, East Garston, Newbury (Dec. 18).

Ches. Woodlands Farm, Allostock, Holmes Chapel, Crewe (Dec. 18).

Fife. Chamberfield Farm, Dunfermline (Dec. 23).

Warwicks. Home Farm, Stoneythorpe, Leamington Spa (Dec. 16).

Wigtown. Logan Mill, Drummore, Stranraer (Dec. 23).

Fowl Pest

Essex. Tiffaynes Farm, North Benfleet, Wickford (Dec. 18); Adelaide Farm, Swallow Cross, Brentwood (Dec. 28).

Herts. 38, Bennington Road, Aston, Stevenage; 41, Bennington Road, Aston, Stevenage (Dec. 17); Heronsgate, Chorley Wood, Rickmansworth (Dec. 26).

Norfolk. Southgate Farm, Rickinghall Inferior, Diss; Nu-End, The Common, Harleston; Walnut Tree Farm, Besthorpe, Attleborough; Corner Farm, Hoxne, Diss (Dec. 16); Capons Farm, Oakley, Diss; Firtree Farm, Syleham, Diss (Dec. 17); Greyhound Cottage, Botesdale, Diss (Dec. 18); Dairy Farm, Hoxne, Diss (Dec. 24); Whitehouse Farm, Oakley, Diss (Dec. 26).

Suffolk. Knoll House, Boyton, Woodbridge (Dec. 16); The Woodlands, Walsham-le-Willows, Bury St. Edmunds (Dec. 18); 8, Grove Road, Walsham-le-Willows, Bury St. Edmunds; Broadway, Halesworth (Dec. 23); Lodge Cottage, Walsham Road, Gislingham, Eye (Dec. 24); Springfield, Upper Holton, Halesworth; Rookery Farm, Westhorpe, Stowmarket; Stonecot Farm, Brome, Eye (Dec. 27).

Yorks. 41, Station Road, Thirsk; Wensleydale Poultry Farm, Thirsk (Dec. 24).

Swine Fever

Bucks. Britwell Orchard, Grove Road, Burnham (Dec. 24); Hill Farm, Forty Green, Beaconsfield (Dec. 27).

Devon. West Town Farm, Whitestone, Exeter (Dec. 23).

Essex. Woodlands Farm, Harwich Road, Little Clacton (Dec. 24).

Herts. Lynsters Farm, West Hyde, Rickmansworth (Dec. 18).

Lancs. Hall Green Farm, Hall Carr Lane, Longton, Preston (Dec. 24).

Leics. The Nurseries, Croft Road, Thurlaston (Dec. 27).

Kent. New Barn Field, Dunton Green (Dec. 17).

Norfolk. Orchard Farm Cottage, The Green, Saxlingham, Norwich; Cricketers Arms, Saxlingham, Norwich; Pear Tree Farm, Hinderclay, Diss (Dec. 16); Woodbottom Farm, Saham Toney, Watton, Thetford (Dec. 18); The Poultry Farm, Little Fakenham, Thetford (Dec. 24).

Notts. Station Road, Sturton-le-Steeple, Retford (Dec. 23).

Suffolk. Craiglea, Yarmouth Road, Broome, Bungay (Dec. 24).

Warwicks. Grange Farm, Bruntingthorpe, Rugby (Dec. 17); Piggery, North End of Rugby Cattle Market, Rugby (Dec. 24).

Wilts. Sprays Farm, Calne (Dec. 27).

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

Distemper Complex

Sir,—I have read with interest, in your issues of November 22nd and 29th, the letters of Messrs. S. F. J. Hodgman and J. K. Bateman concerning the problem of anti-distemper vaccination, and I would like to ask your hospitality for an attempt to clarify some basic weaknesses inherent in the immunising procedures available at present.

There can be no doubt that the prevention of distemper is made more difficult because the disease is not notifiable and hence no statistical data are available concerning the results of the use in the field of various anti-distemper vaccines. It is thus little wonder that their preventive value is estimated from general impressions rather than from well-documented data. This is most unfortunate in that it is bound to produce biased views and opinions.

If we turn to a consideration of the circumstances under which anti-distemper vaccination is carried out, we may find that, approximately, one-third of all annually-weaned puppies are vaccinated against distemper. Whether one believes or disbelieves that live virus preparations produce a better immunity response than killed virus, is a matter of opinion. What matters from the epidemiological standpoint is that, while the majority of the canine population in this country is not protected against distemper, the minority in contact with the non-protected is inoculated with different preparations of live virus, the use of which is not accompanied by any quarantine regulations. Moreover, live virus in different vaccines must have different degrees of attenuation and possess the ability of *in vivo* multiplication (Gorham *et al.*, 1957). Yet, this approach is supposed to work wonders by the eradication of distemper in this country; it seems to me, however, that this is unlikely to occur if conditions remain as they are. I will not labour the obvious truth that a similar approach to the control of foot-and-mouth disease or swine fever simply would not be tolerated.

You are probably aware that while immunisation results, as reported by some veterinary surgeons on both sides of the ocean, appear to be faultless and fantastic, the others suggest that "a more honest acceptance of widespread failure of vaccination would be in the interest of the canine population, the dog-owning public, and the practising veterinarian" (Shnell, 1955), and also that "if distemper—as it now exists in the United States—were a human disease a national emergency would exist" (Sudduth, 1958).

I must say that from my observations during the last 10 years, during which I have had a very keen interest in canine virus distemper, it follows that the position in this country is similar to that in the U.S.A. because the basic weaknesses inherent in the immunising procedures against distemper are similar.

Yours faithfully,
N. M. LARIN.

The Canine Health Centre,
Kennett,
Nr. Newmarket,
Suffolk.

December 16th, 1958.

References

GORHAM, J. R., FARRELL, R. K., OTT, R. L., & PARISOT, T. (1957). *Vet. Med.* **52.** 289.

SHNELL, G. B. (1955). Proceedings of the 92nd Annual Meeting of the A.V.M.A. 82.

SUDDUTH, W. H. "Modern Veterinary Practice." November 15th, 1958.

Sir,—With regard to Mr. H. M. Payne's remark, that "It is remarkable that the 10-year-old bitch had not built up an immunity during her lifetime," the following personal experience may be of interest, as applying to man and beast alike.

I passed through two epidemics of mumps at school, and one at college. In the latter case about 200 of us lived in one large 5-storey building and 35 to 40 per cent. contracted the disease. I failed to contract it in either instance, but some 30 years later my daughter returned from a holiday with mumps. She lived with a friend during her 3 weeks' quarantine and I saw her only occasionally; yet as she came out of quarantine I developed the condition. My point is that immunity may break down.

Yours faithfully,
W. H. WOOD.

11, Winchester Street,
Sherwood,
Nottingham.

December 23rd, 1958.

Sir,—Mr. Hodgman's letter published on November 22nd last raises points of considerable importance to small-animal practitioners, and underlines a situation to which a close parallel is found in North America.

There seems little doubt, in view of the large number of outbreaks encountered in young dogs soon after weaning, that maternal immunity is frequently of short duration. Further, the percentage of "breakdowns" occurring some months after vaccination suggests only a short immunity from a single dose of avianised vaccine.

These suppositions are supported by a recent introduction of a new avianised vaccine for use in

two doses, the first a sensitising dose given at 9 weeks of age, followed by a "booster" dose 10 weeks later. This product is produced by a laboratory under the control of the Canadian Federal Government, who claim that the immunity so obtained is consistently high, and that it remains at an effective level for the life of the animal, whereas the immunity produced from a single-dose vaccine is only too often at a satisfactory level for a short time. It also gives the considerable added advantage of earlier protection, covering what often appears to be the vital few weeks after weaning.

May I, therefore, suggest to practitioners who are experiencing "breakdown" troubles, that they consider the use of avianised vaccine available in the U.K. at weaning, and repeated 10 weeks later, where such a procedure is economically practical. It may be that a half dose of a standard avianised vaccine would prove adequate as a sensitising dose.

Yours faithfully,
P. L. BUILDER.

Box 77,
Prince George,
British Columbia,
Canada.

December 18th, 1958.

Sir,—Mr. Payne's letter in THE VETERINARY RECORD of December 20th interests me, and although I agree with much of it I cannot say I share his satisfaction with the present state of immunisation of dogs against hard pad disease and distemper.

In the summer of 1957 we had a severe widespread outbreak in this area, and of several hundred cases I was called upon to treat a percentage was of inoculated dogs, two at least of which died. Most of these cases had been inoculated some considerable time prior to their contracting the disease. One of the two fatal cases had been inoculated over two years.

This year another outbreak has taken place and although less widespread has claimed a higher percentage of inoculated dogs. I am speaking of typical cases, some of which I have had to fight hard to save. One in particular was inoculated 2½ years ago. I have not yet had time to study fully the counterfoils but it is already clear that not all are recently inoculated.

In the past I have used both "Epivax" and "Caninovac" and I find that a percentage of each has broken down although as yet I cannot give an exact comparison for the reason given above.

My opinion, for what it is worth, is that two injections of vaccine give a much more solid immunity and should be more widely advocated. The optimum time for these could be determined experimentally but in the meantime I am advising 9 weeks and about 6 months of age.

Yours faithfully,
W. J. McCORMICK.

"Crosshaven,"
13, Erleigh Road,
Reading.

December 22nd, 1958.

The R.C.V.S. and the B.V.A.

Sir,—May I again ask the courtesy of your columns to reply to R.C.V.S. and B.V.A. critics?

I wish to point out to Mr. Simpson-White that the conditions in U.K. are not so lamentable as insinuated in "Representation on Official Bodies" (November 15th). Most certainly the British farmer does not need educating by his veterinary surgeon, co-operation and understanding are great. The "educated" N. American farmer needs convincing that the sick animal often requires veterinary attention rather than being shot as is still practised in some parts of N. America.

To give as example the way in which the Canadian government eradicated swine fever conveys precisely nothing! Why not explain to the Canadian how the United Kingdom eradicated rabies? Between April and November, 1958, 1,423 cases of rabies have been confirmed in Canada.

In this age of scientifically controlled abattoirs it is difficult to conceive that the choice method of slaughter is the knife and the hammer. On June 25th, 1958, the Humane Slaughter Bill was given a first reading in the Canadian House of Commons. On September 6th the Minister of Justice announced that it was to be postponed for another year. As a government employee I wish to refrain from comment as to the reason.

Finally I would like to ask whether "the hired hands" system meets with Mr. Simpson-White's approval. In the U.S.A. where the veterinary profession enjoys a high status any person suitably equipped with dollars can open a number of veterinary hospitals and hire the required number of veterinarians to carry out the professional work.

Why not give a little appreciation to the R.C.V.S. and B.V.A.—thanks to them our profession is kept in high esteem throughout the world.

Yours faithfully,
J. R. MITCHELL.

Suite 5,
Shannon Court,
6,024, 118 Avenue,
Edmonton,
Alberta,
Canada.

December 15th, 1958.

Sir,—According to Mr. Guy Anderson's letter, (November 15th) he appears to believe that the status of veterinarians in the United Kingdom is higher than that of those overseas.

In all the countries I have visited recently, namely Tanganyika, Kenya, Uganda, Canada and the United States, I can assure him that the veterinarian is regarded as the supreme authority on all questions pertaining to meat inspection. The situation in the United Kingdom is quite different, where the presiding genius over meat inspection is the local Justice of the Peace, who, as far as I am aware, does not usually undergo a course of training in the intricacies of animal pathology.

With regard to questions of animal disease control, the authority consulted in the first instance is the veterinarian in all the countries named above. A quite different state of affairs is seen in the United Kingdom, where such questions are submitted for a decision either to a bureaucrat who is over-anxious to please his overseas counterparts, or to some party politician. How else can one explain the disgraceful decision to continue importing foot-and-mouth disease from Argentina? Even more deplorable is the fact that this state of affairs has brought forth no protest from the B.V.A. or R.C.V.S. councils.

With regard to the activities of the B.V.A. on behalf of its members, I understand that the appointment of a professional secretary, to undertake public relations duties has been approved by the council. Will someone please tell me whether this official has already been appointed, and if so, has the council mapped out a programme of public relations work for him? I would suggest that any such campaign of publicity work on behalf of the profession should be in two phases, the first having the objective of increasing the prestige of the profession in the eyes of the public, by persuading the Government to set up a comprehensive system of meat inspection under direct veterinary control, to halt the importation of foot-and-mouth disease from Argentina, and to initiate an effective system for the eradication of hog cholera. Having first gained prestige in this way, namely by showing the public how much service we can render to the livestock industry when our full potentialities are unhindered by the dead hand of bureaucracy, then we can expect considerable public sympathy and support for the second phase of our publicity campaign, which would be an all-out effort to increase the remuneration of the profession in all fields of endeavour.

Finally, may I remind our members that the season of New Year resolutions is upon us, and therefore I believe this is an appropriate time to suggest that we all adopt this resolution: that, in 1959, we shall elect to office, both in the R.C.V.S. and the B.V.A., only those candidates who have the necessary force of character and public-speaking ability to express themselves fearlessly on behalf of the profession whenever the opportunity presents itself, and who will work actively for the legitimate aspirations of the profession in every possible way. Then we shall be able to look forward to a truly happy and prosperous New Year.

Yours faithfully,

J. N. SIMPSON-WHITE.

9629, San Luis Avenue,
South Gate,
California, U.S.A.

December 23rd, 1958

A Case of Acute Septicaemia in the Race-horse

Sir,—Experience gained by the R.A.V.C. in India may assist in resolving some of the questions asked in the above clinical note. Habronema tumours in the stomach wall were frequently found *post mortem* in army horses. Accumulated evidence indicated that their clinical effect was determined to a great degree by their position which was more often in the comparatively large non-glandular oesophageal area when they appeared to have little or no effect on the horses' physical condition or health. Habronema tumours, often degenerated into abscesses, in the fundus or cardiac positions, were so frequently found in horses destroyed for chronic debility or recurrent colic, however, that a close connexion between these conditions is indicated. Early symptoms are of chronic digestive disturbances insidious in nature and easily overlooked. In time they progress through the obvious signs of unthriftiness to debility. Lying down for long periods with occasional grinding of the teeth, sometimes with a half-roll, are early indications and later periodic attacks of spasmodic colic related to the feeding and working programme further assist diagnosis. In the race-horse attacks of colic are often seen after racing, a fact which I attribute to too long fasting before a race—the classical hunger-pains of peptic ulcer in man. In fact I believe erratic form may sometimes be due to this condition, and when so recognised modifications in pre-race preparations can be made. A horse rarely stays in training long enough to reach the debilitated stage but poor "doers" are often ineffectually persisted in because of early promise, and the old method of feeding such horses "a little and often" again bears a similarity to peptic ulcer.

A definite diagnosis can be made with ease and rapidity by stomach washes. A warm solution of a mild alkaline (soda bicarbonate) is given by stomach tube, recovered by siphonage, and run over butter muslin. Two or three washes may be necessary to remove food debris and mucus, and if habronema tumours exist in the stomach, their larvae will be seen wriggling on the muslin, often in great numbers. The treatment of choice is by carbon tetrachloride by stomach tube followed by about 10 oz. of plain water to ensure that none of the drug is withdrawn in the tube.

I have never known habronema abscesses to be the primary focus of a septic infection, and in view of the time of the year that this reported case occurred and the rapidly developing hyper-pyrexia, I would suggest heat stroke as a differential diagnosis, and as sweating was not mentioned as one of the symptoms that this was probably induced by non-sweating.

Yours faithfully,

T. F. ARNOLD.

The Mill House,
Alvescot,
Oxon.

December 27th, 1958.

ADVERTISER'S ANNOUNCEMENT

MESSRS. SILTEN LTD. of Hatfield, Hertfordshire, announce that they have appointed Messrs. W. Gimber & Sons Ltd. of 2, Queens Road, Peckham, London, S.E.15, to act as sole distributors of their veterinary products in the United Kingdom as from January 1st, 1959. Future orders should be addressed direct to Messrs. W. Gimber and Sons Ltd.